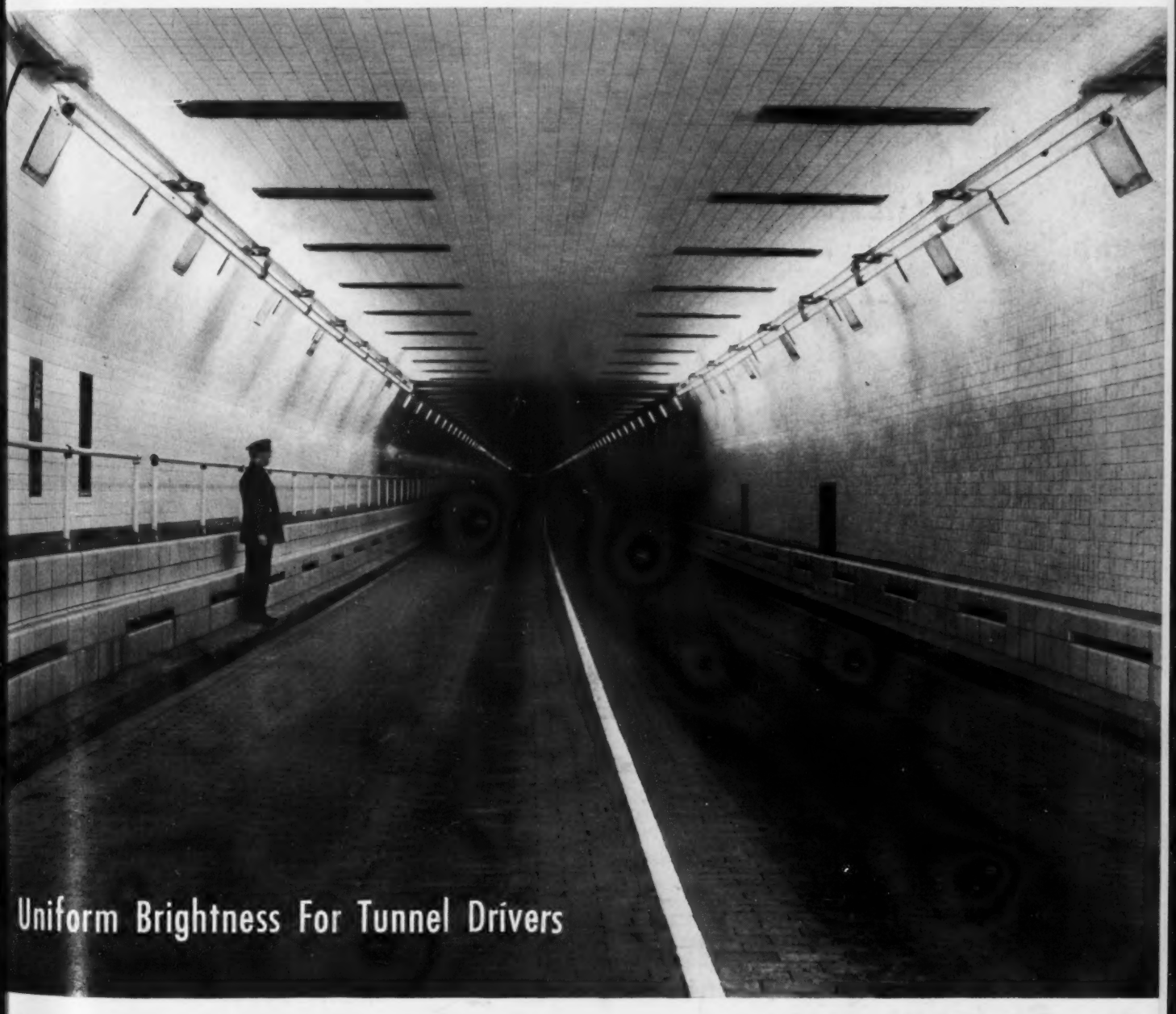
# Electrical World

A McGRAW-HILL PUBLICATION



Uniform Brightness For Tunnel Drivers

DECEMBER 6, 1947

Features

NEWS OF THE WEEK
Resurfacing Upstream Face of Dam
Handling Heavy Rotors Easily and Quickly
Higher Interrupting Capacity Can Help System Design

# INSTRUMENTS FOR ELECTRONIC MAINTENANCE

**WESTON *Electronic Analyzer*** — Model 769. Incorporating: 1. A conventional Volt-Ohm-Milliammeter with self-contained power source. 2. A high-impedance electronic Volt-Ohmmeter using 115 volt, 60 cycle power. 3. A stable, probe-type, Vacuum Tube Voltmeter, for use to 300 megacycles.

**WESTON *Multi-Purpose TUBECHECKER*** — Model 798. This universal tubechecker offers within one instrument provision for testing: 1. Receiving tubes. 2. Voltage regulator tubes. 3. Light duty thyratron tubes such as 2A4—6D4—884—885—2051. Scale is calibrated "Good-Bad" as well as in mutual conductance readings.

***Direct Reading Insulation Tester*** — Model 799. Compact, one-hand-operated insulation tester with .1 to 10,000 megohm range, using a test potential less than 50 volts d-c. Indicates: 1. Insulation properties. 2. Leakage resistance. 3. Conductivity of insulating materials. 4. Leakage due to moisture absorption.

These portable Westons are specifically designed for expediting electronic maintenance . . . for doing the job better— faster. All are engineered and built in the strictest traditions of Weston accuracy and dependability. For further details see your local WESTON representative, or write . . . Weston Electrical Instrument Corporation, 57 Frelinghuysen Avenue, Newark 5, New Jersey.

**WESTON**

*Instruments*

# Electrical World

*FOUNDED IN 1874 • READ BY ELECTRICAL MEN FOR 73 YEARS*

GEORGE C TENNEY.....*Acting Editor*

STANLEY A TUCKER....*Managing Editor*
A E KNOWLTON...*Senior Associate Editor*
DANIEL T BRAYMER.....*Associate Editor*
FRANK R INNES.....*Associate Editor*
RICHARD N LARKIN.....*Associate Editor*
N BRUCE BAGGER.....*Assistant Editor*
RUE M SHOOP.....*Assistant Editor*
KENNETH K KOST.....*News Editor*
EDNA M GLENNON..*Assistant News Editor*
BERLON C COOPER...*Lighting Consultant*
WALTER C HESTON...*Pacific Coast Editor*
H S KNOWLTON.....*New England Editor*
JULIUS C MEIER.....*Western Editor*
G A DOYING.....*Mgr. Washington Bureau*
W B WHICHARD *Washington Correspondent*

ECONOMICS DEPARTMENT.....Dexter M Keezer, *Director*, William F Butler, Sanford S Parker, John D Wilson.

WORLD NEWS BUREAUS.....John Chapman, *Director;* London, Paris, Berlin, Moscow, Shanghai, Bombay, Melbourne, Buenos Aires.

DOMESTIC NEWS BUREAUS.....Atlanta, Chicago, Cleveland, Detroit, San Francisco, Houston. Correspondents in 43 principal cities.

RALPH H FLYNN.....*Publisher*
W W GAREY.....*Manager*

DISTRICT MANAGERS.....E F Coffey, New York; N V Palmer, Boston; F P Coyle, Philadelphia; C R Lippold, Cleveland; R R Ream, Detroit; W H Meneilley, Chicago; J T Schaefer, St. Louis.

The contents of this issue are copyrighted and may not be reproduced without the permission of the copyright owners.

December 6, 1947

## Contents

Vol. 128, No. 23

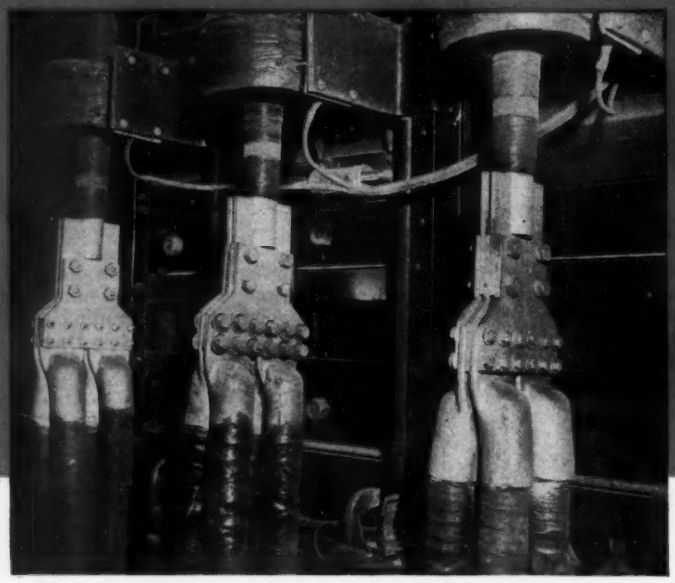
### This Week's Cover Picture

Tests recently conducted in New York's Queens-Midtown tunnel prove the contrast between existing incandescent lighting and the twin rows of fluorescent tubing proposed for the new Brooklyn-Battery under-river thoroughfare. The continuous fluorescent fixtures eliminate the succession of bright spots and shadows that have so long plagued tunnel drivers. Complete details are given on page 82.

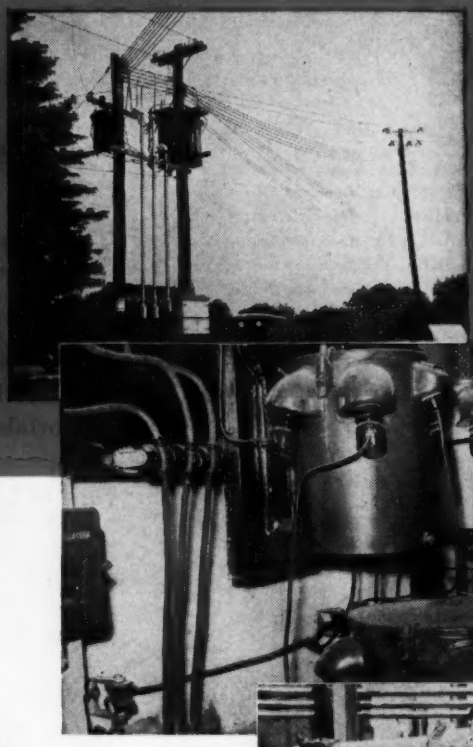
News of the Electrical World..... 72
Editorials .....71 and 80
Washington Comment ..... 81
Line of Light Makes Tunnel Driving Safe and Easy..... 82
LEO GEENENS, Triborough Bridge & Tunnel Authority
Specially Developed Equipment Simplifies Heavy Rotor Handling ..... 84
D. J. COPPS, Bonneville Power Administration
Higher Interrupting Capacity..... 86
S. B. CRARY, General Electric Co
Switched Capacitors Back Bus Regulation..... 89
F. M. REED, Pennsylvania Electric Co
Upstream Face of Dam Refaced with Precast Slabs..... 90
L. B. CARD, Public Service Co of Colorado
Longer Cable Pulls Halve Costs..... 92
R. G. FINNERTY, Boston Edison Co
Giant Crane Has Cross-Flux Control..... 93
Train Operators to Dispatch Reactive Same as Active Power. 94
EDMUND R. PAIGE, Buffalo Niagara Electric Corp
Tailored Financing for Utilities..... 97
HOW ..... 98
Engineering Reference Sheets.....102 and 106
Load Building ..... 124
New Equipment ..... 130
Technical Literature ..... 142
Catalogs and Bulletins..... 147
News About People..... 148
Manufacturers and Markets..... 158
New Electrical Construction..... 162
Index of Advertisements..... 170

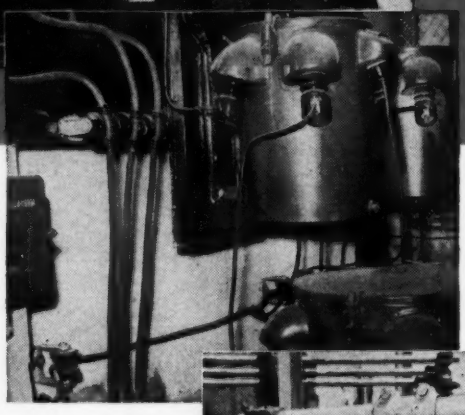
ELECTRICAL WORLD. Published weekly by McGraw-Hill Publishing Company, Inc. Publication Office, 99-129 North Broadway, Albany 1, N. Y. RETURN POSTAGE GUARANTEED. Editorial and Executive Offices, 330 West 42nd St., New York 18, N. Y. Allow at least ten days for change of address. All communications about subscriptions should be addressed to J. E. Blackburn, Jr., Director of Circulation. James H. McGraw, Founder and Honorary Chairman; James H. McGraw, Jr., President; Curtis W. McGraw, Senior Vice-President and Treasurer; Joseph A. Gerardi, Secretary; Nelson Bond, Director of Advertising; Eugene Duffield, Editorial Assistant to the President. J. E. Blackburn, Jr., Director of Circulation. Subscription rates: Single copy 35 cents. In the United States, $6 a year, $9 for two years, $12 for three years. Canada, $7 for one year, $11 for two years, $14 for three years. (Canadian money at par.) Pan-American countries, $15 for one year, $25 for two years, $30 for three years. All other countries $20 for one year, $30 for two years, $40 for three years. Please indicate position and company connection on all subscription orders. Entered as second-class matter, November 16, 1936, at the Post Office at Albany, N. Y., under the Act of March 3, 1879. Printed in U.S.A. Copyright 1947, by McGraw-Hill Publishing Company, Inc. All Rights Reserved. Cable address MCGRAWHILL, New York. Branch Offices: 520 North Michigan Avenue, Chicago 11, Ill.; 68 Post Street, San Francisco 4; Aldwych House, Aldwych, London, W. C. 2; Atlanta, Ga.; Boston, Cleveland, Detroit, Los Angeles, Philadelphia, Pittsburgh, St. Louis, Washington. Member A.B.P. Member A.B.C.

# *Indoors... Outdoors... Today and 30 Years Ago...*
# ALUMINUM HAS PAID OFF ON MANY INSULATED WIRE AND CABLE INSTALLATIONS



**INSTALLED IN 1916** and still operating satisfactorily today. 450 Volt D.C. line carrying 1390 amperes per cable in a Rotary Converter Station. The four 1,590,000 CM aluminum cables insulated with varnished cambric involved 1700 connections to the apparatus.





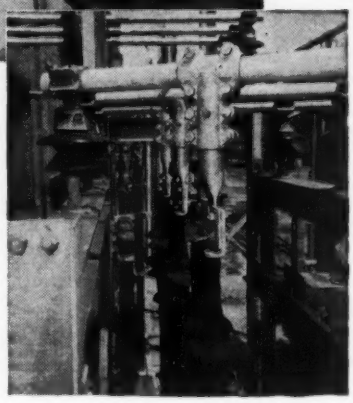


FIGURE IT IN ALUMINUM

Hazard insulated aluminum conductors are being used to advantage for many building wire installations as well as underground, aerial and service entrance cable requirements. Cost savings up to 40% . . . weight savings up to 60% . . . easier handling and pulling — results like these make it worth your while to investigate the use of aluminum conductors when figuring a job.

Hazard Performite Type RH Aluminum Building Wire is carried in factory stock and by many wholesalers — for immediate shipment in sizes 6Awg to 500,000 CM. Other sizes and cable designs can be fabricated in as little as 4 to 6 weeks. Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pa.

*(Top)* **LIGHTING INSTALLATION.** Performite double braided cable with aluminum conductors used for permanent outdoor lighting wiring at a new sports arena in Pennsylvania. *(Center)* **POWER FEEDER CABLES** with aluminum conductors, Performite insulation, Hazaprene jacket, 5KV, used in a state centennial exhibition. *(Bottom)* **HIGH VOLTAGE POWER SUPPLY.** 15KV cables with 800,000 CM aluminum conductors terminated outdoors with welded aluminum lugs bolted to aluminum bus in large southern industrial plant.

**Write for Bulletin H-407-AL which contains tables, calculating data and details of simple splicing and terminating methods.**

6116

**HAZARD**

**insulated wires and cables for every electrical use**

Electrical World — Editorials

DECEMBER 6, 1947

# Pearl Harbor and Public Relations

PEARL HARBOR taught America a lesson. Several lessons.

Remember your own shock and disbelief at the Dec 7 news? The questions you asked? Where is the Navy? Why weren't we prepared? Why was the fleet bottled up in the harbor? It isn't true! I don't believe it! Why weren't we alerted? Somebody's to blame!

For utility management today—this month—the Pearl Harbor anniversary holds a particular lesson. Simply this: The public recoils from the unexpected—particularly where its welfare and security is affected. This is axiomatic. Shock is the very essence of news.

This axiom—this law—of public relations demands the attention of any utility executive whose service is even remotely threatened by a shortage of generating capacity this winter.

There will be a few spots in the country—on this sixth anniversary of Pearl Harbor—where there will not be enough capacity to meet the load. Still others will be touch-and-go.

A number of companies, where the situation is ominous, have had the foresight to tell the public what to expect and ask for cooperation. They will get it. But there are others—particularly those who think they have a chance to squeak by with the help of God, overloading and interconnections—that are holding their breath in stern and rock-bound silence.

Such silence is not in the public interest. It is not in the industry's interest or best traditions. It certainly is not good public relations.

The public is the guy next door. He has his troubles too. Shortages and long deliveries aren't strangers to him. Hasn't he been on "the list" for a new car since last Michaelmas?

He'll be tolerant of any power company that tells him frankly in advance that unavoidable shortages are threatening the perfection of its service; that curtailment or voltage reduction may be necessary. Then, if and when the curtailment program arrives, he'll go along.

But woe to the harried utility that with tongue in cheek tries to ride out the storm on its luck and gets caught short. When that guy next door is surprised, he sees red. Ask his wife about that new hat she bought last month on the quiet!

The world will rock some night when he comes home to find the refrigerator motor won't run and Junior's new electric train is on the fritz. It won't help matters any, when he sits down under the fading light of his hitherto pet floor lamp, to read that the power company regrets to announce that it is fresh out of kilowatts and will have to curtail service.

It's too late then. He's been surprised. Let down. Here come the questions. What's he paying his money for? How come the power company just found out about all this? They're supposed to be smart. What are all those expensive engineers for if not to watch out for things like this? They can sing for their money next month. Wait till the meter reader comes!

Do they have a familiar ring? It's Pearl Harbor all over again—with a difference. The guy next door couldn't walk into an office in Washington on Dec 8 and read the riot act to a red-faced admiral or general. But wait till the lodge meets next Tuesday!

It'll be too late then to remember Pearl Harbor!

# ★ ★ NEWS OF THE

## New Portal-to-Portal Pay Law Interpreted by Its Administrator

**McComb Issues Bulletin to Assist Employers and Unions—Admits Interpretations May Be Wrong but Will Use Them as Guide in Administering Law—Courts Have Final Say**

*By Joseph Gambatese*

WASHINGTON — Since May 14, many employers and unions have been busy figuring where they stand under the new portal-to-portal pay law. Most of the 1,900 claims for $6 billion in back wages under the Fair Labor Standards Act, pending when the law was passed, have either been withdrawn or dismissed by the courts.

But there remained the necessity of knowing what liabilities for employers and rights for workers exist under today's law. As usual, only the courts can provide the final answer. But last week, both groups got some help from the government.

This help was an interpretative bulletin, issued by William R. McComb, Wage-Hour Administrator. In it, McComb tells what he thinks the new law means and how he will guide himself in administering it.

McComb gives no answers which employers might use as a "good faith" defense against employee claims. But he does explain what he thinks Congress meant by "good faith" and by other terms used in the law. Anyone disagreeing with his interpretations is invited to suggest changes.

Employers who rely "in good faith" on rulings and other actions of the government are absolved by the law from liability. Obviously then, this term has special importance. What does it mean?

Relying on the legislative background, McComb gives this advice:

An employer's "good faith" cannot be determined merely from his state of mind. It depends also on an objective test of whether he acted as "a reasonably prudent man would have acted under the same or similar circumstances." Further, "good faith" requires an employer to have "honesty of intention and no knowledge of circumstances which ought to put him upon inquiry."

McComb gives some examples of what he's saying. It's all right for an employer to rely on a ruling covering his employees. But if such a ruling is based on court decisions which are later upset, and the employer hears of the upset, he is not acting in good faith if he continues to rely on the original ruling. As a "reasonably prudent man," he would be expected to make further inquiry on what he heard.

Another McComb illustration: Federal Agency X issues a bulletin stating, erroneously, that such-and-such employees are exempt from the Wage-Hour law. An employer who relies on this information is not acting in good faith if he knows that the law involved is administered by the wage-hour office. In such a situation, the employer would be expected to make further inquiry of Wage-Hour.

McComb cautions that his interpretations are not necessarily correct, but rather they are his judgment of what the courts "may" decide.

The Administrator makes four general statements regarding the portal pay law's effect on the Fair Labor Standards Act. The new law:

1. Leaves unaffected the whistle-to-whistle workday and what has been known as "hours worked" within that period.

2. Differentiates between an employee's "principal" activities and those performed "preliminary" or "postliminary" to his "workday."

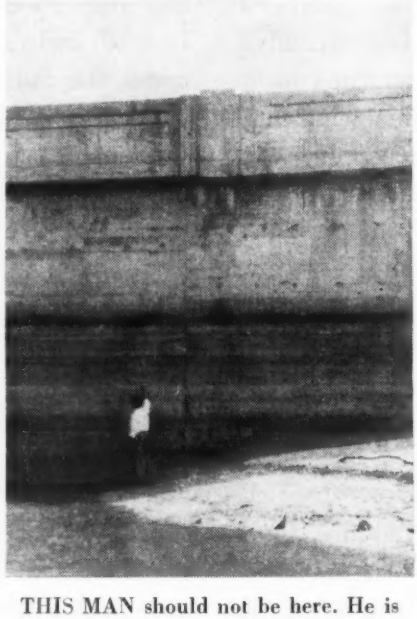
3. Does not affect an employer's liability to pay an employee for his "principal" activities.

4. Relieves employers of liability only as to those "preliminary" or "postliminary" activities outside the "workday" for which payment is not provided by contract, custom, or practice.

"Principal activities," in McComb's view, would include any closely related activities that are an integral part of and indispensable to the main task. His example: A lathe operator who has to oil, grease, or clean his machine or install a new cutting tool at the beginning of the day.

"Preliminary" and "postliminary" activities, he explains, would include walking, riding or traveling to the place where the principal activity is performed, as well as other tasks done before the morning whistle and after the evening whistle, such as punching the time clock or waiting to be paid. As to these, contract, custom, or practice will determine whether they shall be considered "hours worked" for overtime pay purposes.

The bulletin does not cover the law's application for the period before May 14, when it was passed.



THIS MAN should not be here. He is pointing to the normal waterline on the Bagnell Dam of the Union Electric Co of Missouri. Water behind the dam is the lowest in company history, 12 ft below normal. The water shortage has caused a serious capacity situation in St. Louis

•

### Dimout Saves Electricity

Despite its great unpopularity, especially with retail merchants, the dimout order of the Ontario Hydro-Electric Power Commission has already reduced demand by 50,000 kw.

# ELECTRICAL WORLD ★ ★

## Atomic Storage Batteries Would Be Safe, Convenient

Atomic storage batteries have been suggested by Atomic Energy Commissioner Lewis Strauss as one way of putting to work the energy of nuclear fission. The idea is to put to work the radioactivity of materials which have been exposed to an atomic pile. The scheme has been talked of speculatively before, but this is the first authoritative mention of it as a practical possibility.

When an atomic pile is running, the fission products (pieces of split uranium atoms) are intensely radioactive. Similarly, materials inserted into the pile and exposed to the energies there become radioactive. This means that they are continually giving off energy in the form of radiation or high-velocity particles. This process continues for anything from a few seconds to thousands of years, depending on the material.

If a quantity of such radioactive material were enclosed in a box, the thinking goes, the box would get hot and continue to do so for a long time. This heat could be used to drive an engine.

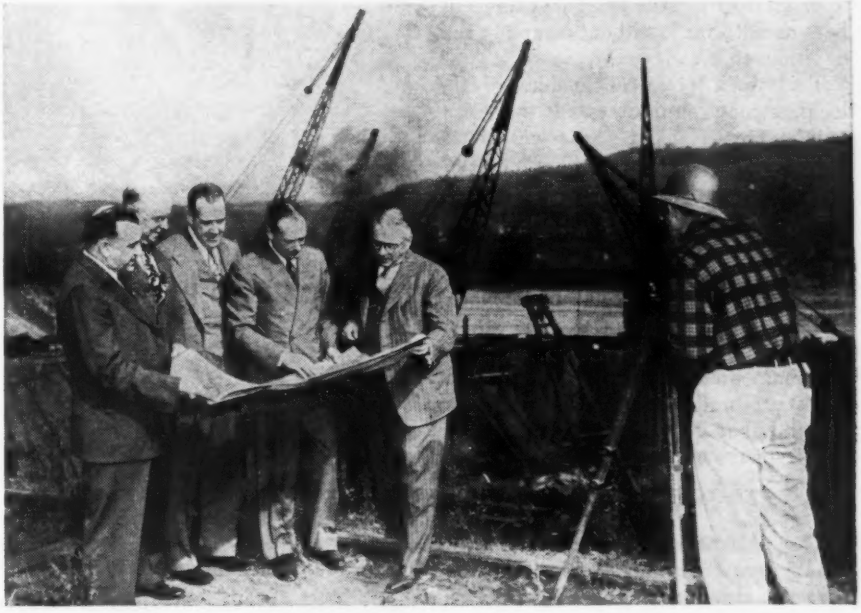
The energy source thus obtained could hardly be as powerful as an atomic pile, but it would be a lot safer and easier to use. By selection of the proper radioactive materials, the most lethal radiations could be avoided, thus easing the shielding problem and consequently reducing weight. So such a long-lived "battery" might be valuable for low-power applications such as vehicle propulsion.

The tiny pinches of radioactive material now furnished to researchers by AEC have energy outputs as high as a fiftieth of a watt.

•

## New Unit by Christmas

Installation of a new 1,250-kva turbogenerator, scheduled to be placed in operation around Christmas, will step up capacity of the Durango, Colo., steam plant to 2,500 kva, according to Western Colorado Power Co officials. To increase efficiency of the new steam turbine, the latest of the plant's three boilers is being reconditioned and converted to burn natural gas or fuel oil. The first two boilers were converted from coal last year.



**OHIO EDISON CO officials on a trip to the Toronto, Ohio, plant study plans of the addition being built to house two 60,000-kw units. When completed the plant will have a capacity of 300,000 kw. Left to right: Vice-President Rufus Moses; H. C. Molter, superintendent of the Toronto plant; Andrew Carnegie, superintendent of power production; President Walter H. Sammis; Frank W. Funk, in charge of production and chief engineer; at the transit, G. W. Cornog, project engineer.**

## WAA May Ask New Bids on Oklahoma Power Plant

The War Assets Administration may throw out all present bids for power facilities of the war surplus Oklahoma Ordnance Works and advertise for new offers. WAA officials hinted they were considering this possibility as a House Executive Expenditures Subcommittee opened hearings on disposal of the property this week (Dec 2).

Controversy over the property began when the Grand River Dam Authority, an Oklahoma state agency, offered $3,500,000 for the plant, which houses four steam generating units with a total capacity of 20,000 kw. This amount exceeded the next highest bid, submitted by the Public Service Co of Oklahoma, by $1,000,000 (EW, Nov 22, Page 66).

Subsequently, Public Service presented a new bid of $3,600,000 with the provision that the terms of sale would permit expansion of the plant's generating capacity. WAA spokesmen have stated they had not solicited this second offer from the company but that they were "considering" it.

They asserted that a WAA review board is studying GRDA's claim for preference in the sale—as a state body—under the Surplus Property Act. The review board may not reach a decision for some weeks, they added.

•

## Arizona Utility Asks Court to Compel Rate Increase

The Eloy Light, Power & Utility Co has asked superior court action to force the Arizona Corporation Commission to grant the utility a rate increase for the period from last June 1 to Aug 27.

The utility charges the rate set by the Commission will cost the company $80,693, claiming that increased rates are necessary because it must pay higher rates to the Salt River Valley Water Users' Association, its source of power.

The commission refused the utility a higher rate on the claim the increased costs it must pay are occasioned by the utility's negligence in failing to negotiate a new contract.

## 3 Local 248 Officers Defy UAW, Bar Administrator

Local 248, United Automobile Workers, CIO, is back in the news. This is the union which conducted a 328-day strike at the West Allis plant of the Allis-Chalmers Manufacturing Co and lost. Last spring the local sent its members back to work without company recognition or a contract.

This week (Dec 2) leaders of the local, strong supporters of the Communist party, locked themselves in the local's headquarters and defied the administrator appointed last week by UAW's executive board to take over the affairs of the local and protect its assets.

The executive board's appointee is Duane Greathouse, Chicago-Milwaukee regional director. He was ordered to take immediate steps to regain bargaining status under the ruling of the National Labor Relations Board and the requirements of the Taft-Hartley Act.

***Three Officers Resign***

The Atlantic City convention of UAW went on record in favor of union officials signing non-Communist affidavits as required by the Taft-Hartley Act. Three Local 248 officers, President Robert Buse, Vice-President Joseph Dombek, and Treasurer Linus Lindberg, then resigned. All said that they were "unable to get along with the policy set at the convention."

The executive board refused to accept the resignations and ousted all officers of the local. Greathouse's representatives arrived Dec 1 and took over the local's offices and changed the lock. When they returned in the morning, the lock was jammed. Inside the office were Buse, Dombek, and Harold Christoffel, honorary president and bargaining agent.

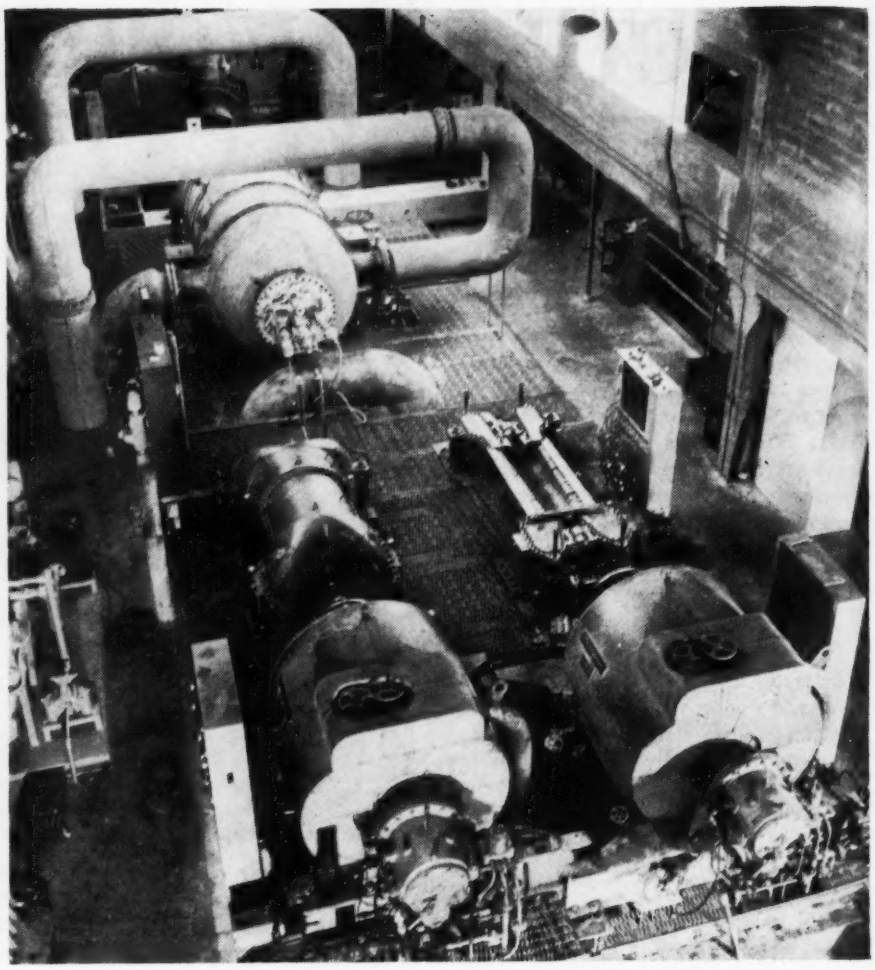
By telephone they then informed the press that they would "not recognize the action taken by the international executive board" on the ground that it was "illegal."

UAW has gone to court to get possession of the office.

•

## Wisconsin Line Sold

The Kegonsa Electric Line Co, believed to be the oldest entirely rural electric power line corporation in the United States, has been sold to Stoughton, Wis. The company's 26 miles of lines will be incorporated in the municipal power system. Organized in 1916 with 28 customers, the company has been serving 475 customers in the area north and west of Stoughton.



GAS-TURBINE LABORATORY at the South Philadelphia Works of Westinghouse Electric Corp, largest test stand in the world, can load test compressors up to 6,000 hp and corresponding turbine components

## Burley, Idaho, Dissatisfied with Reclamation Contract

Burley, Idaho, has refused to accept the terms of a ten-year power contract with the Bureau of Reclamation and has made preliminary application to the Idaho Power Co for service if the city's needs are not met.

Needing more power, the city is attempting to replace its contract with the Bureau, which will expire in 1952. The Bureau offer would reduce the cost of power to the city by $17,000 yearly, based on 1946 consumption. However, since most of the profits of the bureau sale go the Burley Irrigation District, it would lose needed funds. The city is dependent, so officials claim, on the prosperity of the irrigated countryside surrounding it.

Under the new bureau contract, the city would also be obliged to reduce rates to consumers in the city.

The new offer makes no provisions for "dump" power for space heating purposes. The present contract allows 1,500 kw for this purpose. At present the demand is 2,000 kw. It is this power that the city wishes to buy from Idaho Power.

•

## Oregon Co-op Will Buy Gold Beach Utilities Co

The Coos Bay and Curry Electric Cooperative has negotiated for the purchase of the generating plant and power lines of the Gold Beach Cooperative Utilities Co in southwestern Oregon. The purchase will be made through funds obtained in a recent federal loan of $450,000.

Plans of the company call for construction of six miles of 66-kv transmission line from the California border to Brookings, Ore., and a 23-kv line on to Gold Beach. These lines will carry current from the California-Oregon Power Co.

The company's generating plant at Gold Beach will be rebuilt, with three new generating units to supplement the two present units.

## English TVA Suggested as Competition Incentive

**Former Churchill Cabinet Officer Does not Believe This Would Aid Socialization of Power Industry**

A setup like the TVA would be a good thing in England, Lord Hinchingbrook, a former official in the Churchill cabinet, told members of the Eastern Division Power Distributors Association at a recent meeting in Chattanooga.

The advantages, he said, would not be a trend in socialization of the electric power industry, but would act as a competitive spur to the privately owned enterprises. Lord Hinchingbrook did not favor socialization of industry in England and was opposed to any such move in the electric industry. He said that the Socialists would welcome the TVA idea.

Henry I. Madden, central station engineer for Westinghouse Electric Corp, discussed the loading of distribution transformers and pointed out the effect of certain factors in physical and economic life. He said that indications are that the 1942 ASA Guides for operation of transformers and regulators will be revised to increase transformer load limits, as has been suggested.

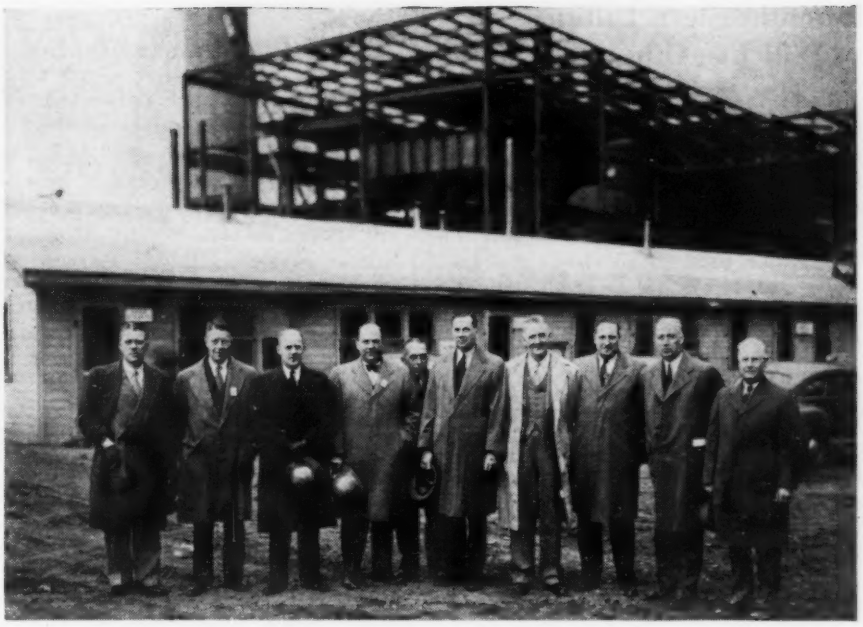
A further discussion on determining load and diversity on distribution transformers was led by Robert C. Stevenson, Jr, system planning engineer for the Chattanooga Electric Power Board. Stevenson told of the survey made on his system using thermal type demand meters. Daily reports are made, and the practice is to replace transformers that have a load of 150 percent or more of the rating. New transformers are installed on a basis of 100 percent load after taking into consideration any load growth that might be indicated.

***Unit Substations Have Advantages***

L. W. Long, manager, substation section, Allis-Chalmers Manufacturing Co, presented charts to point up the fact that while unit substations are not as flexible as an assembled substation, yet they offer definite advantages on the system.

Buford H. Martin, electrical development division of TVA, covered the distribution economics of electric heating and brought out that studies made by TVA showed that such load is profitable. However, the heating load will force rebuilding of many systems.

It was generally agreed that while it might be uneconomical for many of the small organizations to have a full time home economist, it is feasible for two or more to join in a cooperative venture so as to obtain such service on a part-time basis.



**OFFICERS AND DIRECTORS of the Pennsylvania Electric Co after completing an inspection tour of the utility's new Warren plant now nearing completion. The first 35,000-kw turbo-generator will be in operation by next summer and the second a year later. Left to right, B. M. Kirsch, vice-president in charge of sales; E. W. Morehouse, director; R. F. Pruner, secretary-treasurer; A. F. Tegen, director; H. A. Busch, General Public Utilities Corp; D. W. Jardine, president; R. A. Gallagher, vice-president in charge of industrial relations; P. R. Lawson, comptroller; W. H. Wade, vice-president in charge of operations; and W. C. Sontum, vice-president in charge of the technical department**

## N.H. Public Service Will Add Mercury-Vapor Unit

A 40,000-kw, combination mercury-vapor and steam turbine generating plant is to be built by the Public Service Co of New Hampshire at Portsmouth. Its cost will exceed $5,000,000. About half the total capacity will be in service early in 1949 and the remainder in 1950. General Electric Co equipment will be used. President A. R. Schiller told ELECTRICAL WORLD that increases in fuel costs committed the utility to this development. Experience with the mercury cycle at Hartford and subsequent improvements of the past two decades pointed the way to this decision.

The new station will contain two 26,500-hp boilers supplying two 10,000-hp mercury turbines and one 33,000-hp steam turbine. The mercury boiler pressure will be 128 psi at 962 F. Vapor condensed after passing through the mercury turbines will generate steam at 643 psi to operate the 33,000-hp turbine after superheating to 825 F. Each mercury generator will drive a 7,500-kw, 0.8 power-factor generator. A 25,000-kw, hydrogen-cooled generator will be driven by the steam turbine. The net result in increased efficiency will be to produce electrical energy with only 80 percent of the fuel needed by a comparable plant using steam only. About 250,000 lb of mercury costing about $300,000 will be provided for the plant, for use over and over again indefinitely.

The new station will be built on a tide-water tract of land recently acquired from the Diatomite Co. The plant will be operated on a balanced schedule in connection with the company's hydro and steam stations.

•

## Peak Loads Set Record

The aggregate of major electric utility system peak loads for September, 1947, was 43,772,062 kw, according to figures released by the Federal Power Commission. This was the highest total of record, exceeding the previous maximum of 43,173,808 kw set in December, 1946, by 1.4 percent. The September peak loads were about 4,431,000 kw or 11.3 percent higher than September of last year and 715,000 kw above the August, 1947, total. Corresponding energy requirements for September were 21,073,644,000 kwhr, 13.8 percent above those for September, 1946. August, 1947, energy requirements were 21,393,348,000 kwhr.

## 3 Southeastern Utilities Will Use Oilostatic Cables

Three Southeastern electric utilities are planning the installation of Oilostatic cables with variations in each installation and with the one installed recently by the Georgia Power Co.

The Birmingham Electric Co job involves the use of 13.8-kv generator leads and 110-kv transmission circuit. It will have two circuits and a circuit length of 9,240 ft. There will be one pipe with three conductors of 400-MCM non-compack. The Okonite cable will tie in the overhead line to the Powell Avenue substation and is expected to be completed in March, 1948.

Alabama Power Co will not install its cable until next year. Involved are some 110-kv and 44-kv circuits. The principal feature will be the direct connections of the Oilostatic cables into the transformers rather than having potheads mounted on a structure. This job will have two circuits totaling 1,000 ft and will have three conductors per pipe of 1,250-MCM segmental. It will tie in the new generating station, now under construction at Gadsden, with the switching station.

The Tampa Electric Co job will not be completed until late this year and is a 69-kv transmission circuit. Its principal difference, as compared with the Georgia Power installation, is that welded joints, rather than Dresser sleeves, will be used on the pipe. There will be one complete and one spare pipe circuit, with three conductors in the pipe of 350 MCM. The cable will tie the Hockers Point station to the 11th Avenue substation in Tampa.

•

## PUD Takes Over Utility

The Franklin County PUD of Pasco, Wash., has taken over the management of Pacific Power & Light Co facilities in the county, after making payment of $1,221,475. The payment, made at a hearing before Superior Judge B. B. Horrigan, included the $1,200,000 price placed on the holdings by a jury earlier this year, plus $21,061 improvements and $414 costs.

•

## J. Herbert Walker Dies

J. Herbert Walker, a vice-president of the Detroit Edison Co, died in Detroit on Dec. 1. Identified with the utility since 1912, Walker was elected a vice-president in 1945. He was 57 years old.

### *2,535,000-Kw Available*

**The Consolidated Edison Co of New York has increased the capacity of its system to 2,535,000 kw. The utility has added another 50,000-kw steam unit at its Sherman Creek station at 201st Street and the Harlem River in Manhattan.**

## Santee-Cooper Gets Even, Won't Sell Power to Utility

If the Santee-Cooper Authority cannot buy the South Carolina Power Co, it can quit selling power to the utility. It has done just that. The Authority has served formal notice on the state Public Service Commission that it will cancel its contract with the utility in November, 1949.

Under its present contract with South Carolina Power, which is cancelable only with 24-months' notice, the Authority is selling the utility annually 150,000,000 kwhr of electricity at 5.5 mills.

The Authority gave no reason for canceling the contract. However, the South Carolina Electric & Gas Co has contracted to buy South Carolina Power (EW, Nov 15, Page 20). The Authority was also interested in acquiring the utility. General Manager R. M. Jefferies of the Authority told the PSC that it was "not a good deal" and that if Santee-Cooper could not buy the utility it did not want South Carolina Electric & Gas to have it.

South Carolina Power immediately issued a statement that even if the contract with the Authority is not renewed in 1949 no power shortage will result. The company last month (Nov 20) put the first 22,500-kw unit at Plant Hagood into operation. This unit alone can provide over 150,000,000 kwhr a year. A second unit of the same size has been ordered. In addition South Carolina Electric & Gas will be in a position to fill the power requirements of both systems.

•

## More Capacity for Eugene

The Eugene, Ore., Water Board has announced plans to increase the city's power capacity to 50,500 kw by 1950. It will place an order in the near future for a $386,000 generating unit for the old Walterville plant, replacing a 3,000-kw with an 8,000-kw unit. Peak load for the present system has been approximately 28,700 kw.

## Utilities Used More Lead, Copper, Aluminum in 1946

Use of copper, lead, and aluminum by the light and power companies in the United States for transmission and distribution purposes, and for generator busbars, according to a survey by the American Bureau of Metal Statistics, increased in 1946. Figures in tons:

| Copper | 1945 | 1946 |
|---|---|---|
| Metropolitan companies | 10,500 | 20,600 |
| All other companies | 38,700 | 71,900 |
| Totals | 49,200 | 92,500 |
| **Lead** | | |
| Metropolitan companies | 7,200 | 9,600 |
| All other companies | 4,500 | 5,000 |
| Totals | 11,700 | 14,600 |
| **Aluminum** | | |
| Metropolitan companies | 800 | 900 |
| All other companies | 17,900 | 32,000 |
| Totals | 18,700 | 32,900 |

Metropolitan companies are those serving communities over 300,000 in population. Municipal plants are included in the survey, but governmental projects have been omitted.

Installations and removal of copper by the public utility companies, including municipals, and confined to busbars, wire, and cable for transmission and distribution, from 1937 to 1946, inclusive, in tons, was as follows:

| | Installation | Old Copper Sold |
|---|---|---|
| 1937 | 83,000 | 20,900 |
| 1938 | 62,000 | 17,900 |
| 1939 | 67,000 | 15,800 |
| 1940 | 74,000 | 19,600 |
| 1941 | 94,000 | 21,800 |
| 1942 | 42,000 | 13,900 |
| 1943 | 20,000 | 10,300 |
| 1944 | 22,000 | 9,400 |
| 1945 | 49,200 | 8,600 |
| 1946 | 92,500 | 10,900 |

The peak year in use of copper by the utility companies for the purposes indicated was 1930, when installations accounted for 130,000 tons. Old scrap sold by the utilities in that year amounted to 36,000 tons.

•

## Buying Plant Site

Representatives of the Buffalo Niagara Electric Corp are obtaining options on upland property bordering on the harbor front at Dunkirk, N. Y., as a prospective site for a steam electric generating station.

•

## Utility Gains Franchises

Greene, Iowa, has voted the Interstate Power Co a 15-year franchise. The utility has also secured 25-year franchises at Sherburn and Winnebago, Minn., and an indeterminate franchise at Dickeyville, Wis.

## Reclamation Likely to Get Scolding and More Funds

*(ELECTRICAL WORLD Staff Report)*

WASHINGTON — The Bureau of Reclamation will ask Congress for approximately $40,000,000 in supplemental appropriations early next month to continue construction on four major projects. Though the Bureau is due for some sharp verbal spankings at the hands of appropriations committees, it probably will get most of the money it wants.

A supplemental request for additional funds for the Columbia Basin, Central Valley, Colorado-Big Thompson, and Davis Dam projects now is being processed by the Budget Bureau. It is expected that Budget will pare each of the project requests, which now are reported as about $15,000,000 for the Columbia Basin, $10,000,000 for California's Central Valley, and around $8,000,000 for each of the other two projects.

The Budget Bureau probably will complete the supplemental request in time for presentation to Congress in the opening days of the next session. Reclamation Commissioner Straus has advised members of the appropriations committees that available funds for the four projects will be exhausted "about Feb 1" and that work will be stopped on all of them at that time.

The Bureau's request will be considered by subcommittees on deficiency appropriations, but the subcommittees on Interior appropriations probably will take part in drafting the bill. Members of these committees blasted Straus for not keeping project expenditures within the limits set by the regular Interior Appropriation Bill for fiscal 1948. But they reluctantly admitted that they probably would approve any additional funds necessary to continue construction on the projects involved.

•

## Southwestern G&E Plans 16,500-Kw Stop-Gap Plant

Immediate development of an emergency stop-gap steam electric generating plant is underway at Karnack, Tex., at an estimated cost of $1,000,000. This announcement was made by Vice-President E. F. Graham of the Southwestern Gas & Electric Co.

Site of the emergency plant at the Longhorn Ordnance Works was leased from the U. S. War Department, and arrangements have been made to lease four boilers. Two used turbines, 10,000 and 6,500 kw, have been purchased by the company. The plant is to be in operation by July 1, 1948.

**NEWLY ELECTED directors of the Petroleum Electric Power Association are: Left to right, seated, L. V. Dugas, Gulf States Utilities Co; PEPA President A. R. Watson, Southwestern Public Service Co; and PEPA Secretary and Treasurer John B. Moore, Northern Indiana Public Service Co. Standing, PEPA Vice-President C. L. McNeese, Houston Lighting & Power Co; Paul Griffith, Arkansas Power & Light Co; R. E. Patrick, Kansas Gas & Electric Co; and B. F. Thompson, Public Service Co of Oklahoma**

## Fishing and Power Blocs Feud in Pacific Northwest

The Pacific Northwest can have its power dams and still preserve its salmon fishing industry, according to federal and state agencies involved in development of the Columbia Basin. But the bitter dispute over dams vs fish conservation still rages in the area.

Recommendations that development of multiple purpose projects on the Columbia and its tributaries be pushed rapidly were approved recently by both the Federal Inter-Agency River Basin Committee and the Columbia Basin Inter-Agency Committee. Their report also called for stepping up fish conservation work in the area. The two committees, neither of which has any administrative authority, are composed of representatives of various federal and state agencies interested in development of the Columbia.

Meanwhile, however, the Oregon Fish Commission, Washington's Department of Fisheries, and Interior Department's Fish and Wildlife Service jointly issued a report blasting the Reclamation Bureau and the Army Engineers for building Columbia Basin dams without "due consideration" for fishery resources.

The Inter-Agency committees especially urged speedy construction of Hungry Horse, Foster Creek, Detroit, and McNary Dams, and expansion of existing hydro-electric generating capacity in the area. The committee rejected a proposal that upstream dams on the Columbia, Snake, and other rivers be scheduled for construction ahead of downstream projects.

This plan has some regional support as a means of allowing the area's fishing industry and development agencies to provide fish conservation facilities before new dams are built across salmon runs.

Instead, the committees demanded speedy construction of all dams authorized by Congress, with development of "all feasible" fish conservation projects at the same time.

Other recommendations included the maintaining of "the closest cooperation" with private and public utilities "to encourage the expansion of existing power generating facilities, or the construction of such new facilities as harmonize with the comprehensive and optimum development of the region."

•

## Energy for Every Farm

By June, 1948, the Detroit Edison Co expects to have made available central station service to all of the 39,000 farms in its 7,600-sq mile territory. This will mark the completion of a rural electrification program started in 1923. Future efforts will be devoted to increasing the use of electricity on the farm. A special staff of farm representatives will assist in this work.

# SEC RULINGS

General Public Utilities Corp has been authorized to make a cash capital contribution of $400,000 to its indirect subsidiary, Staten Island Edison Co, to aid the latter in its construction program and for other corporate purposes. (Release No. 7835).

North American Co's proposal to distribute on Dec 22 to holders of its common stock of record Nov 26 common stock of Wisconsin Electric Power Co (par value $10) and Potomac Electric Power Co has been approved. North American Co estimates that transactions will involve distribution of 1,624,787 shares of Wisconsin Electric Power and $502,509 in cash and 1,784,305 shares of Potomac Electric Power common and about $271,089 in cash. (Release No. 7846).

American & Foreign Power Co's plan of reorganization as recently amended in line with suggestions made by the SEC on Nov 4 has won the commission's final approval. The amended plan calls for a shift of allocations of assets from the public holders of the company's second preferred and common stocks to the public holders of the first preferred stock. The SEC had disapproved the company's original plan on the ground that it undercompensated the holders of the first preferred stock "to the extent of about $3,000,000." Allocation of securities under the amended plan would be as follows: preferred, $83,292,700 of 4½ percent debentures and 1,470,357 shares of common stock; second preferred, 154,368 shares of common stock; common, 26,222 shares of common stock. Electric Bond & Share Co, American & Foreign Power's parent, would receive $8,098,900 of 4½ percent debentures and 3,349,050 common shares for its holdings. (Release No. 7849).

Appalachian Electric Power Co's application whereby it would issue and sell $28,000,000 of first mortgage bonds, series due in 1977, and 75,000 shares of $100 par value cumulative preferred stock has been approved. The bonds are to be sold at competitive bidding and the stock offered initially to the company's preferred stockholders on pro-rata basis. Any unsubscribed shares would be sold to a group of underwriters for public offering. Appalachian also will sell to its parent, American Gas & Electric Co, 30,023 shares of its no par value common stock for $10,000,000. Proceeds will be used to retire debt and finance construction. (Release No. 7853).

Interstate Power Co has received permission to sell two collateral promissory notes, each for $1,500,000, bearing interest of 3 percent annually. One note is to be sold to the Chase National Bank of New York and the other to the Manufacturers Trust Co, New York. The notes will mature on April 15, 1948. The company stated the transaction was proposed to extend the maturity of outstanding notes aggregating $3,000,000 and due Dec 1, 1947. (Release No. 7854).

Electric Power & Light Co and its subsidiary, New Orleans Public Service Inc, have received the green light from the commission on their joint application and declaration and amendment thereto pursuant to Sections 6 (b), 7, 9 (a), 10, 12 (c) and 12 (f) of the Public Utility Holding Company Act of 1935. New Orleans proposes to issue and sell 199,642 shares of its common stock without nominal or par value at $25 per share. New Orleans proposes to offer such common stock, in the ratio of 0.265 shares for each share held, on a pro-rata basis to the holders of its common stock of record as of a date to be determined by the company's board of directors. Subscription warrants, expiring approximately 20 days after their issuance date, will be issued to all present holders of New Orleans common stock. Electric Power, as the holder of 716,737 shares (95.1 percent) of New Orleans' outstanding common stock, proposes to purchase 189,935 shares, the number of full shares to which it will be entitled pursuant to the rights offering. New Orleans states that the proceeds from the sale of the common stock proposed to be issued will be used for construction of additions and betterments to its property and for general corporate purposes. (Release No. 7859).

•

## UE Bargaining Victory Means Nothing to NLRB

The United Electrical, Radio & Machine Workers' refusal to comply with non-Communist affidavit provisions of the Taft-Hartley Act struck home last week.

The UE-CIO won a bargaining election over the International Brotherhood of Electrical Workers, AFL, at Colonial Radio Corp's plant in Riverside, Calif, on Aug 14, a week before the Taft-Hartley Act became effective. But the National Labor Relations Board has unanimously refused to certify the UE-CIO as bargaining agent because of its failure to comply with the law.

However, on Aug 21, the company signed a contract with UE. This contract is still in force; but if any labor troubles now arise, UE will get no support from NLRB.

The UE-CIO obtained 97 out of 186 votes cast in the election which was held at the request of the IBEW. The CIO union was on the ballot as an intervenor.

# MEETINGS

**Previously Listed**

*Pennsylvania Electric Association*—Meter Committee, Benjamin Franklin Hotel, Philadelphia, December 11-12.

*Interstate Power Club of New York*—Meeting, Hotel Martinique, New York, December 15.

*Canadian Electrical Association*—Winter Conference, Chateau Frontenac, Quebec, January 12-18.

*American Institute of Electrical Engineers*—Winter General Meeting, William Penn Hotel, Pittsburgh, January 26-30.

## Ebasco Strike Continues; Effect on Company Nil

The strike of designers, draftsmen, and technicians of Ebasco Services, Inc, New York was still under way this week (Dec 3) with indications that it would go on forever. Pickets still walked their beats, but no negotiations were in progress to bring about a settlement.

The 365 members of Local 231 of the Federation of Architects, Engineers, Chemists, and Technicians, a unit of the United Office and Professional Workers, CIO, struck Sept 5 for a 12 percent wage increase. They also asked greater seniority protection and a reduction in the subcontracting of work to outside designers.

A few informal conferences were held by the management with company representatives. Nothing happened. About 130 of the men went back to work. Then Ebasco notified the others that because of changing conditions there was no longer any work for them.

Last month a group of strikers invaded a meeting of Ebasco stockholders to plead for a "decent, living wage." A company official pointed out that the strikers had received an average wage of well over $5,000, including overtime payments, during 1946.

An Ebasco spokesman informed Electrical World that all work is being handled as usual. He also said that many of the men who had not returned had secured other employment.

•

## Northwest Public Power Association Opens Office

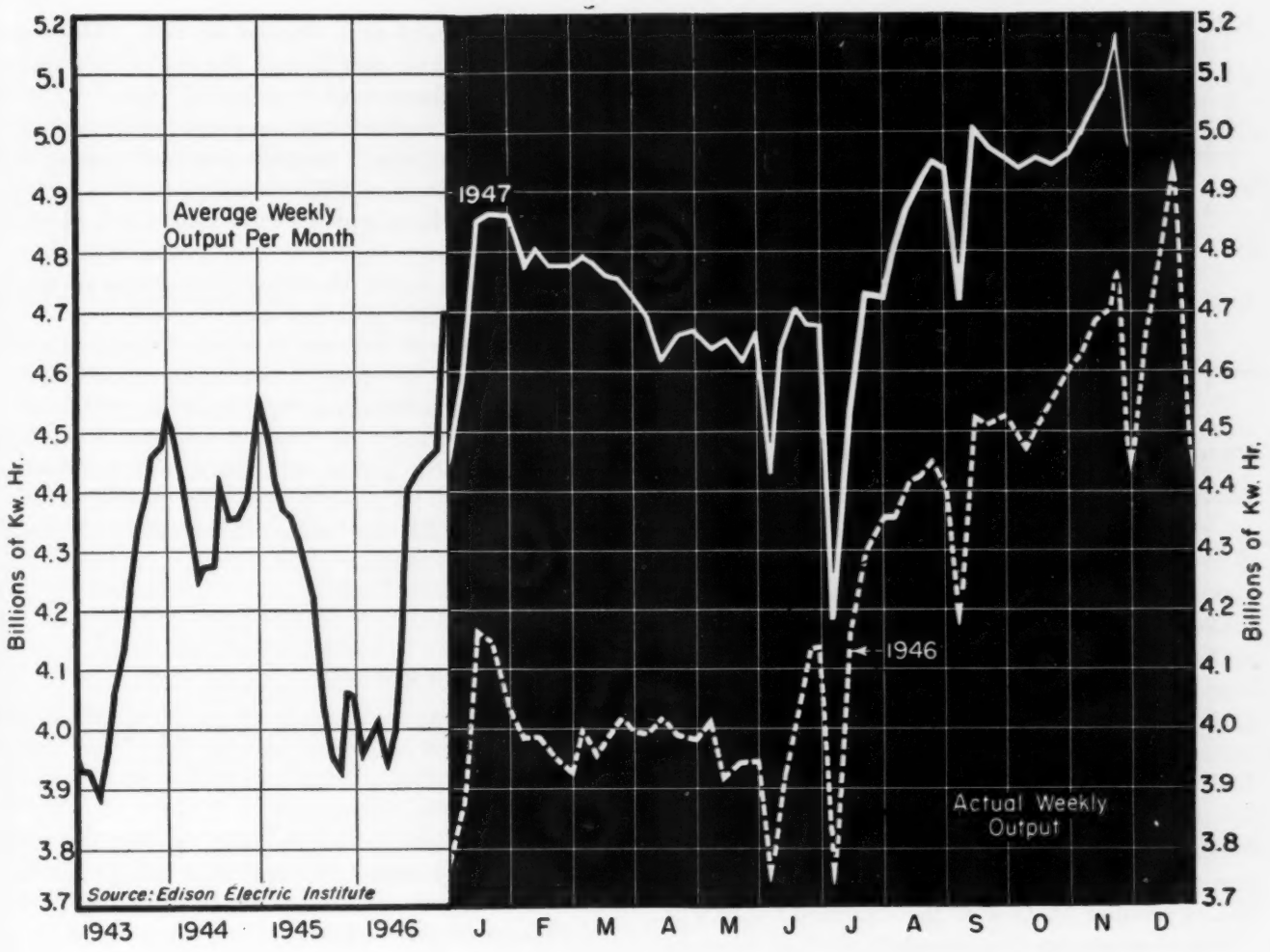
The Northwest Public Power Association has opened headquarters at Vancouver, Wash., with Gus Norwood as executive secretary. The association consists of municipal electric systems, rural electrification cooperatives, and public utility districts in the Pacific Northwest and Alaska. The association is concerned with the exchange of management and public relations information.

Norwood is a graduate of the U. S. Naval Academy with a war-time naval engineering background and also has completed graduate work at Harvard.

•

## Utility Gets Franchise

The Bremerton, Wash., City Council has granted a ten-year non-exclusive franchise to the Puget Sound Power & Light Co, which has been operating in the city without a franchise for a number of years.




## Electrical Union May Ask Third-Round Wage Raise

Third-round wage demands of the United Electrical, Radio & Machine Workers, CIO, may crystallize, the first week in January at a New York conference of union representatives from General Motors, General Electric, Westinghouse, Sylvania, RCA, and General Cable plants.

Preliminary discussions with committees from individual companies have been in progress for several weeks in New York with James J. Matles, UE Director of Organization, and other international officials.

All sessions have followed the same pattern of attack on corporation profits and high prices. The argument made is that Congress cannot be expected to reduce prices and that "substantial" wage increases will be necessary "to narrow the gap between the cost of living and workers' earnings." The UE believes wage increases can come out of profits without further price increases.

This is the same theory popularized by Walter P. Reuther, president of the United Automobile Workers, CIO, who has taken firm control of UAW-CIO leadership and swung the union to the CIO right, leaving the left-wing UE a minority of one among the CIO's big three steel, auto, and electrical workers.

•

## Duquesne Buying Power

Duquesne Light Co has signed a contract with the Koppers Co for purchase of power from a 35,000-kw plant at Kobuta. The plant is a part of a synthetic rubber project which Koppers leased from the government.

•

## Utility Changes Name

Rumford Falls Light & Water Co, Rumford, Me., has changed its name to Rumford Light Co. There is no change in ownership, personnel or policies.

### *Other News*


| | |
|---|---|
| **New Equipment** | **Page 130** |
| **News About People** | **148** |
| **Manufacturers & Markets** | **158** |
| **Construction** | **162** |


## Holiday Depresses Output

Although the electric output, following the Thanksgiving seasonal trend, dropped sharply during the week ended Nov. 29, 1947, it maintained a 12.0 percent lead over the corresponding week of last year, the Edison Electric Institute reports. The percent increase for the preceding week was only 8.7 percent. The amount of electrical energy distributed in the last week in November totaled 4,983,439,000 kwhr, comparing with 5,180,496,000 kwhr during the preceding week and with 4,448,193,000 kwhr during the week ended Nov. 30, 1946.

**Weekly Output, Millions Kwhr**

| 1947 | | 1946 | | 1945 | |
|---|---|---|---|---|---|
| Nov. 29 | 4,983 | Nov. 30 | 4,448 | Dec. 1 | 4,043 |
| Nov. 22 | 5,180 | Nov. 23 | 4,765 | Nov. 24 | 3,841 |
| Nov. 15 | 5,084 | Nov. 16 | 4,700 | Nov. 17 | 3,985 |
| Nov. 8 | 5,057 | Nov. 9 | 4,682 | Nov. 10 | 3,948 |
| Nov. 1 | 5,009 | Nov. 2 | 4,628 | Nov. 3 | 3,899 |
| Oct. 25 | 4,964 | Oct. 26 | 4,602 | Oct. 27 | 3,937 |
| Oct. 18 | 4,946 | Oct. 19 | 4,540 | Oct. 20 | 3,915 |
| Oct. 11 | 4,958 | Oct. 12 | 4,495 | Oct. 13 | 3,934 |
| Oct. 4 | 4,935 | Oct. 5 | 4,478 | Oct. 6 | 4,028 |
| Sept. 27 | 4,956 | Sept. 28 | 4,518 | Sept. 29 | 4,039 |

**Percent Change from Previous Year**

| | Nov. 29 | Nov. 22 | Nov. 15 |
|---|---|---|---|
| New England | +10.1 | + 6.8 | + 7.9 |
| Mid-Atlantic | +10.8 | + 7.7 | + 7.5 |
| Central Industrial | +14.1 | +10.6 | + 9.9 |
| West Central | +17.3 | +13.8 | +12.7 |
| Southern States | +11.9 | + 8.4 | + 7.6 |
| Rocky Mountain | +11.8 | + 8.5 | + 7.3 |
| Pacific Coast | + 8.4 | + 5.7 | + 5.1 |
| Total United States | +12.0 | + 8.7 | + 8.2 |

# Electrical World

# OPINION

### *Hunting Season Has Opened*

MEMBER Leland Olds of the Federal Power Commission put on his red hat, recently, shouldered his gun and went off to Albany to address New York State's Young Democrats. At the same time, he opened the 1948 political hunting season. This last item, which accounts for the red hat and the shotgun, came when he asked the Young Democrats ". . . to join me in making it (electric power) an issue which the Democratic Party will again ride to victory in 1948."

We suspect that in Albany, Olds was hunting for more than a 1948 issue capable of yielding a Democratic victory one year hence. It looks as if he might just have been opening the Leland Olds hunting season—with the reward a return by Olds to the chairmanship of FPC.

Olds resigned the chairmanship not long after last fall's sweeping GOP election victory. For good reasons or bad, Olds, and to a lesser extent, all of FPC, had been unpopular among Congress' Republican minority. When that minority became a majority, FPC made a fast switch of chairmen. The motivation may not have been to help FPC on Capitol Hill, but that has been one result.

We think Olds would like to return to the chairmanship, and we feel quite certain that he'd like to see a Congress as militant on the power issue as were those of the early New Deal days. We think the Albany speech was an admission that Olds, like Barkus, is willing—willing, that is, to return to the chairmanship and willing to help the Democratic National Committee win the election which could return Olds to the chairmanship.

ELECTRICAL WORLD, however, doesn't think so much of the Albany speech. Olds is a quasi judicial regulator of the electric utility industry. By law he may investigate members of the industry, bring charges against them, direct the prosecution, serve as an appeals judge on exceptions to the examiner's conduct of hearings and, finally, rule on the record. He may do all of this at a time when administrative finality is at a new high.

Since he is empowered by law to do all these things, we think he is prohibited by the law of good taste, by the law of ethics, by the law of good government from being so bland a political partisan as he was at Albany. And we don't want any of that nonsense about his not speaking at Albany as a member of FPC. That's as ridiculous as saying that George Marshall didn't speak at Harvard last June as the Secretary of State.

Before he is anything else—a public power man or a private power man, a reproduction cost man or an original cost man—an FPC commissioner is a public servant. As such, he must strive to uphold and advance the public interest. As far as he is permitted to do so by law, he must apply his philosophies and convictions to that job. These philosophies and convictions may evoke disagreement, but they may not disbar him once he is confirmed. In return, he must disbar himself from participation in matters that reflect upon his performance in the public interest. We feel sure that Olds would be the first to complain against utility regulation by blatantly political figures. Yet he approached this at Albany. We would like to think that Olds didn't consider all these things before he went to Albany.

### *Lighting, Eventually*

WHEN, according to the first verses of the Book of Genesis, the Lord said, "Let there be light," and there was light, no mention was made of light sources or lighting fixtures. There just was light.

This idea of light, a thing by itself, separate from the means of its provision must have been strongly in the minds of two speakers at the recent International Lighting Exposition and Conference in Chicago. Ward Harrison, the sage of Nela Park, foresaw the eventual disappearance of visible fixtures and portable lamps from the home and the ascendancy of the louvered ceiling or something like it for office lighting. Gerald Wendt, editor of *Science Illustrated*, referred to a possible future time when light might be "like music in the air," coming from no particular direction, but from all directions, ubiquitous in space.

(Relevant here is a remark of one of the Exposition exhibitors. He said that buyers of lighting should be harnessed with martingales to prevent them from lifting their heads to look at the fixtures. Thus they would see only what they are buying, which is lighting.)

The coincidence of thought of these two men, one an established authority in the lighting art and the other a man of parts in general science but not a lighting expert, is significant. It should be taken seriously. In whatever field, the ideas that make for progress find first expression in the work or words of a few. Then, soon or late, these ideas are recognized as the wants or needs of the many, and a forward step in civilization is taken. It seems to us, therefore, that the lighting industry should give directed thought towards the end indicated by Messrs Harrison and Wendt.

But this does not mean we advise the instant abolition of lighting fixtures, far from it. Evolution of lighting fixtures is the very means by which the end will be attained. Millions of them will be designed, manufactured

and installed, and will serve their purposes and be discarded for better ones, in that evolution. But we do feel that the industry will be wise to look ahead, and deliberately to point its steps, towards the time when light just will *be*, as in the Old Testament account of creation.

### *How Not to Regulate*

RHODE ISLAND'S legislature and its governor have culminated what looks like a political fight against the New England Telephone and Telegraph Co by enacting a law which holds up what seems to be a legal rate increase.

It is unclear, at the moment, exactly what motivated the entire episode, and considerable of the detail is lacking. But what apparently happened is that NET&T filed a new rate schedule April 3. Rhode Island law provided that such filings, unless acted upon within 90 days by the state commission, become effective. No action was taken by July 3, but, on request, the company postponed action until Nov 3. Then it postponed action again until Dec 3. Late in November, when the company declined a third postponement sought by Gov. Pastore, an all-night legislative session was held, postponing the effective date of the scheduled increases until April 2 unless the new tariffs win prior approval by the State Public Utilities Administrator.

Perhaps judgment should not be passed on Rhode Island's action in the absence of a full and detailed knowledge of the facts and the motivations of all concerned. Still, in this instance, it seems that Pastore's action on its face has weakened effective utility regulation. Telephone rate increases have been adjudged necessary by numerous commissions during the last year or so. The company here walked a long second mile by agreeing to two postponements, totalling five months. It continued service at the old rates during a period of rising costs. It complied with the law. Yet all this was insufficient. Now it faces additional waiting, which could bring to one full year the interval between the date of filing and the effective date. What reason will NET&T—or other Rhode Island utilities—have in the future for agreeing to any postponement of the effective date of a new rate schedule? And would the state have been as liberal with postponements had the rate adjustment worked the other way—called for a decrease instead?

Gov. Pastore, we think, has gone entirely counter to the principles of utility regulation here. There remains no argument regarding the need for regulation of monopolistic public service enterprises. One starts from there. If the Rhode Island statute be too weak to protect the public, let it be strengthened—in the conventional way, not in all-night, rush-rush session. If the State Commission is up to its job, then let it perform that job. Let it do so free of the fear that the governor will pass, personally, upon every decision it makes.

## WASHINGTON COMMENT

*W. B. WHICHARD*

IT'S EASY to disagree with Federal Power Commissioner Leland Olds. Other government officers, notably members of Congress and the War Production Board, frequently have done so. And a sizable segment of the electric utility industry has opposed his opinions for years.

The latest barrage against Olds stems from a recent speech at a political rally in Albany. An avowed New Dealer, the commissioner urged a group of Young Democrats to climb back upon the Roosevelt public power bandwagon to ride to victory in 1948. He poured fire and brimstone on the utility industry, charging it with attempts to prevent public power development.

No one was surprised by the tenor of these remarks. Commissioner Olds has never made a secret of his political sympathies or his suspicions of certain utilities. What upset the industry and embarrassed other members of the Commission, however, was his timing. In a few days FPC —at the direction of a Congressional subcommittee—will sit down with electric utility officials to discuss the Miller bills. Idea of the session is to explore grounds—if any—for compromise on these proposed amendments of the Federal Power Act.

At Albany, Commissioner Olds made a thinly veiled reference to the Miller bills as an effort to turn over the nation's water resources to "unlimited private exploitation" and to free interstate electric utilities from "effective federal regulation."

Some of his colleagues obviously fear that the Olds speech will jeopardize the Commission's chance of conferring with the industry in a friendly atmosphere. A few industry spokesmen even ventured a hasty opinion that the speech was deliberately aimed at so doing.

It is unfortunate that Commissioner Olds, as a member of a quasi-judicial body, cannot refrain from colored political comment. It is even more unfortunate that his latest outburst came just prior to the FPC-industry conference.

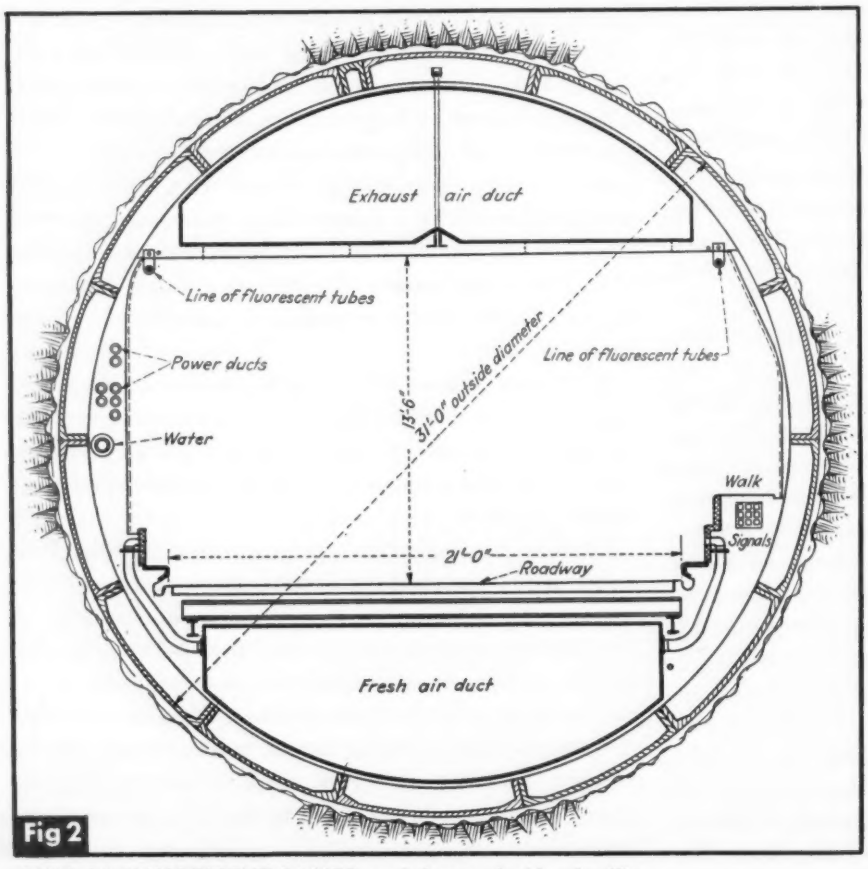
On the other hand, he is a political appointee, selected by, and responsible only to the President. Further, he has a definite personal stake in next year's election. His term expires in June, 1949. If the Republicans again capture the Senate, he will face a confirmation fight if reappointed. If the GOP also wins the White House, his reappointment is unlikely.

Informed utility men long have realized that any compromise with the Commission on the Miller bills would be made only over the protests of Commissioner Olds. At this point, they are not likely to allow the Albany speech to interfere measurably with a reasonable and healthy discussion of the issues involved with FPC—which, after all, has three other members.

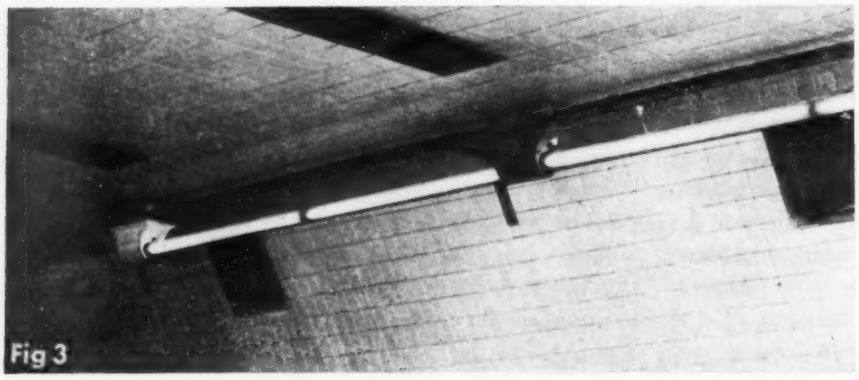
# Line of Light

**LEO GEENENS**
Electrical Engineer of Vehicular Tunnels
Triborough Bridge & Tunnel Authority
New York

**EXPERIMENTAL FLUORESCENT LIGHTING** in Queens-Midtown Tunnel was so superior to concentrated sources it set the pattern for the new Brooklyn-Battery Tunnel




**LINE OF FLUORESCENT LAMPS** carried at each side of ceiling



**BRACKETS AT CEILING CORNER** support glass carrier housing fluorescent tubes

TWO LINES of fluorescent tubing along the ceiling will light the new Brooklyn-Battery Tunnel. The installation will use only one-seventh the annual kilowatthours used by incandescent lights in other Manhattan vehicular tunnels for equal illumination. Moreover this lighting will result in: (1) Practically uniform brightness and foot-candles; (2) no distracting flashes in the eye when passing concentrated light sources; (3) easy control of optimum brightness in the transition from outdoor sunlight to the light of the tunnel.

These results have already been achieved in proof tests in the Queens-Midtown tunnel. Here the contrast between the lighting of the 100-ft test section and the existing installation of incandescent lighting is startling. (See Fig 1). The white tile walls are uniformly bright; a scalloping effect results from spaced light sources. With continuous fluorescent lamps there is no succession of bright spots and shadows as the vehicle intercepts the light. Operators are not dazzled by the flashing of intermittent lighting on other vehicles. The only apparent motion is that of the vehicles themselves.

This line-of-light installation departs completely from conventional theories of interior lighting. In a tunnel or underpass, neither horizontal nor vertical foot-candles have practical significance. Fast, safe and comfortable driving requires the elimination of brightness contrasts. Steady and uniform brightness is needed with no "motion" in the light itself.

### *Fixture Details*

To accomplish this, the lighting of the new twin-tube tunnel will consist of two continuous rows of fluorescent lamps mounted on the face of each wall near the ceiling. (See Fig 2). The 1-in tubes will be 69⅞-in. long, single-contact Slimlines, rated 4,500 F White. Rated current is 200 ma.

# Makes Tunnel Driving Safe and Easy

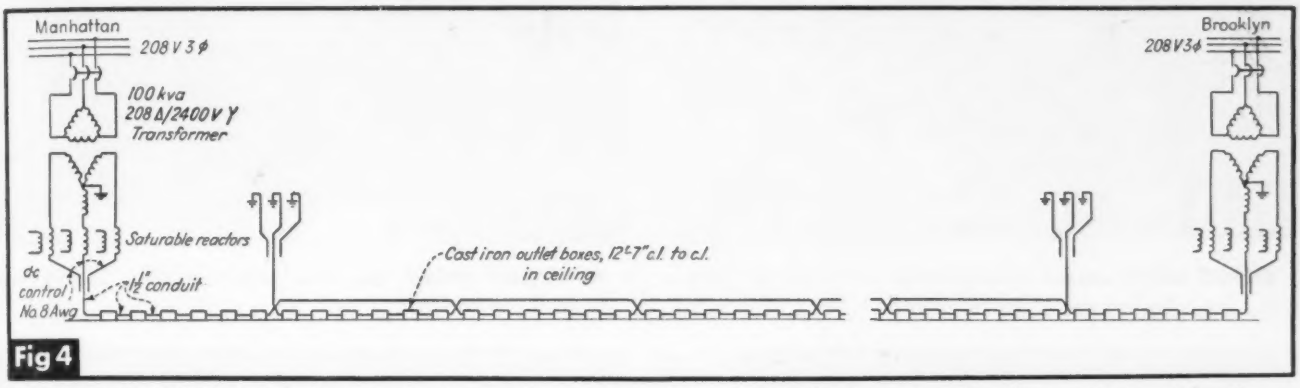



Fig 4

**STAGGERED PHASES** of duplicate overlapping supplies assure continuity of series lighting system throughout entire tunnel length

Two lamps will operate in series on each series transformer and will be mounted in a carrier of Pyrex glass pipe (2-in. inside diam, ¼-in. wall). The carrier will be suspended 5½ in. below the ceiling and 6 in. out from the sidewall. Carrier ends are closed with center-contact insulating caps. Each carrier is held in cast bronze brackets as shown in Fig 3. An end spring holds the carrier tightly against the contacts.

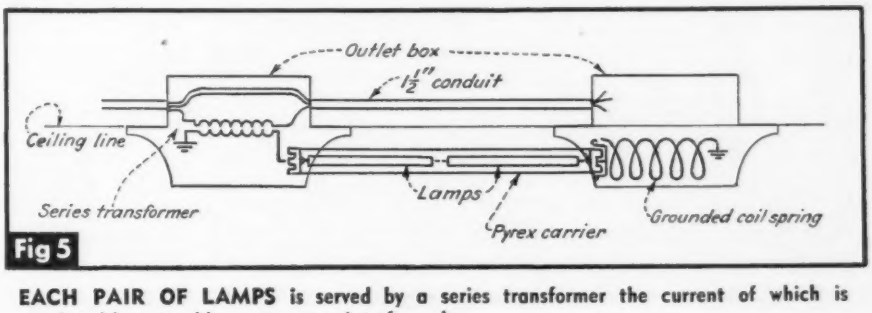



Fig 5

**EACH PAIR OF LAMPS** is served by a series transformer the current of which is regulated by saturable reactor at point of supply

Each bracket contains a series transformer. The primaries are connected in series, 92 of them per line, in twelve lines for each tunnel. This arrangement is a variation of conventional series street lighting. The need for control of intensity, particularly at the portals, necessitates replacing customary constant current station transformer with a saturable core reactor. The direct current in the reactor will be varied automatically or manually to regulate the current in the series line to manipulate the lumen output of the corresponding fluorescent lamps. (See Fig 4 and 5). Current control will also compensate for the decline of light from fluorescent lamps at times of low temperature within the tunnel.

### *Development Stages*

Research and experimentation on this lighting started in 1937. A 4-ft, 40-w lamp was tried first. Installed end-to-end, it consumed more power per foot of tunnel than conventional incandescents and provided more light than necessary. A 10-ft cold-cathode lamp was tried next. It was generally satisfactory but did not lend itself to intensive illumination near the portals because it was limited to about 125.

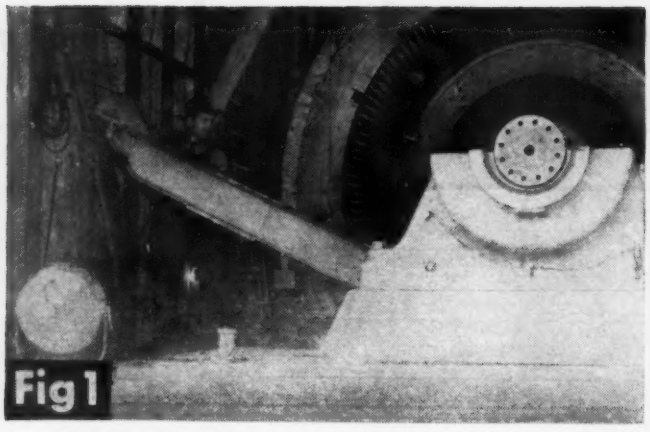
Current variations in the early trials were obtained by varying the voltage applied to the sign-type transformer which fed the (high-voltage) lamps. This caused flickering, spiralling and often failure to start. H. W. Lord of General Electric suggested the series system with control through a saturable-core reactor. This gave full voltage for starting or re-striking regardless of the value of operating current desired at the time.

Recessed fixtures, flush with the wall or ceiling, were too costly and gave unsatisfactory distribution of light. Continuous troughs in the ceiling were unsatisfactory from the structural standpoint because they weakened the ceiling slab.

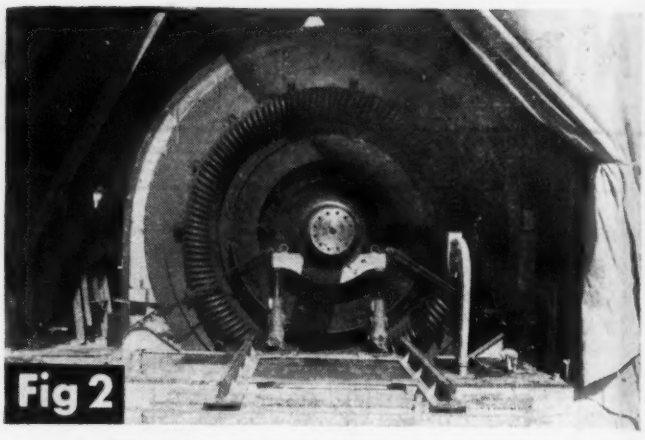
Tests at Nela Park determined the behavior of fluorescent lamps in cold surroundings with various enclosures. The Pyrex pipe chosen is a standard product for conveying liquids in various chemical and dairy plants.

To increase the light near the portals during daylight hours, the transformers for the first 1,800 ft of tunnel are divided in twelve groups in twelve series lines on each wall. Each group is controlled independently of the others. Current in the lamps of the first group on each wall will be raised to 450 ma and in successive groups will be graduated to the value normally used in the middle-mile stretch of the tunnels. Tests indicate that from 50 to 75 ma will be needed during the summer and about 200 ma in winter months.

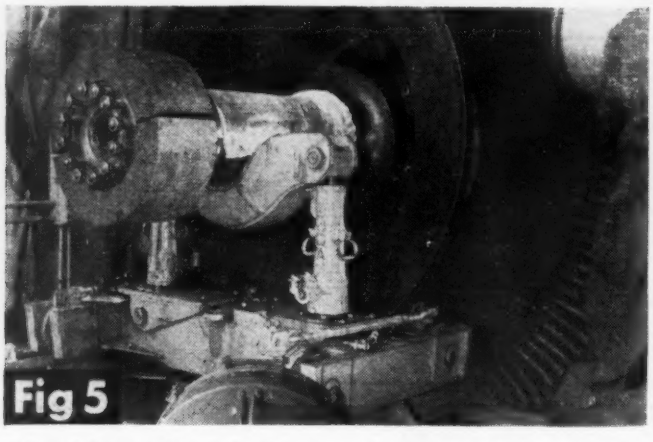
Separate Manhattan and Brooklyn utility network systems supply the power for this tunnel lighting installation. The 208-v service is transformed to 2,400 v in 100-kva transformers. Each phase is connected through saturable reactors to the staggered groupings of lamps in series. Each supply thus reaches the entire length of the tunnel. The conduits and outlet boxes are out of sight above the ceiling. Brackets and tubes are placed well above the roofs of trucks.



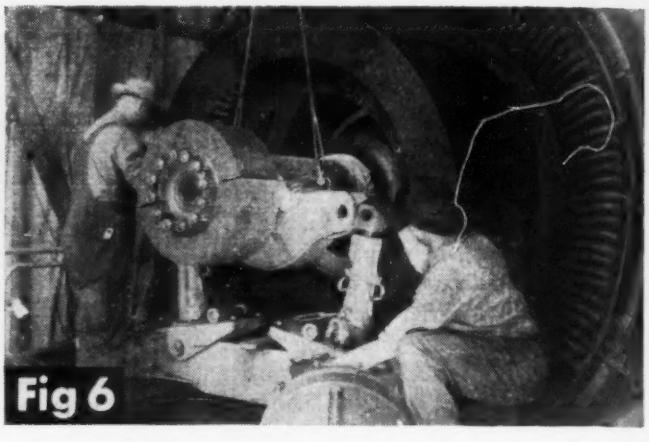

**BRIDGE BEAM** installed close to stator and across the machine pit. This is the first step in the operation




**YOKE AND JACKS** take rotor weight so that bearing and pedestal can be removed




**YOKE-MOUNTED JACKS** and carriage-mounted jacks take rotor weight alternately to facilitate fan removal




**FAN PARTIALLY REMOVED** as rotor yoke is supported from overhead sling

# Specially Developed Equipment

**D. J. COPPS**
Bonneville Power Administration
Portland, Ore.

GREATER SPEED, ease and safety in handling large rotors has resulted from use of special equipment by the Bonneville Power Administration. Large machines present a problem when rotors must be removed and reinstalled because of the tremendous weights and small clearances involved. The conventional cribbing and roller method is time-consuming, laborious, involves hazards to equipment and personnel, and is costly.

The accompanying photographs show how the Bonneville method has simplified this problem. The pictures were taken during the overhaul of a 35,000-kva synchronous condenser. The rotor weighed 56 tons.

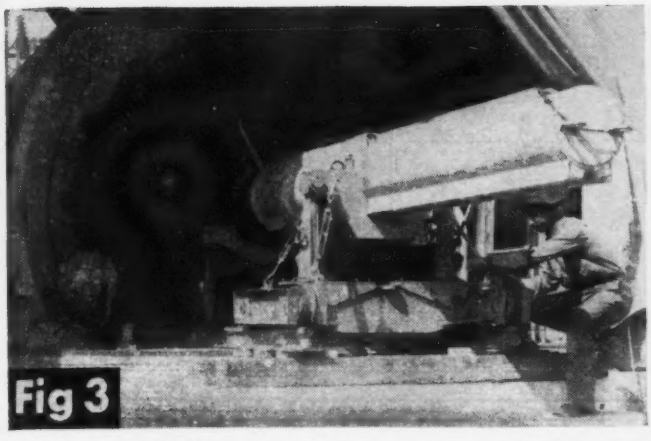
Special yokes are jacked up to take the weight of the rotor at each end of the shaft. On one end, a shaft extension permits the rotor to be moved endwise to clear the stator. The jacks are mounted to trucks on rails. Once the weight of the rotor is taken, and bearing pedestals, fan housing, etc, removed, the rotor is easily pulled with block and tackle.

### *Sequence of Operations*

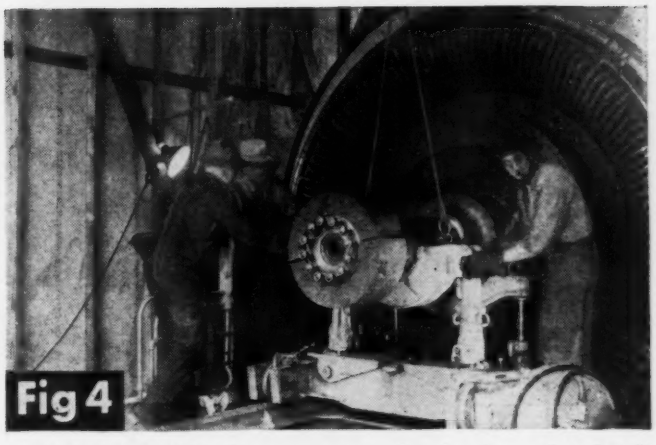
The first operation consists of installing a special bridge beam, close to the stator, and across the machine pit. This is shown in Fig 1. Jacks placed beneath this beam support it for the jacks shown in Fig 2. Here, the yoke has taken the weight of the rotor so that bearing and pedestal can be removed. The shaft extension is installed next. See Fig 3. The rotor weight is taken on the jack-carriage assembly shown.

Operations are now directed to the other end of the machine. First, the rotor weight is taken on a jack-mounted yoke and bridge beam in the same manner as shown in Fig 2. Bearing and pedestal are removed. Weight of the rotor is then taken on the carriage. See Fig 4. The fan is removed next, taking the weight alternately on the yoke-mounted jacks and the carriage-mounted jacks. See Fig 5, 6, and 7.

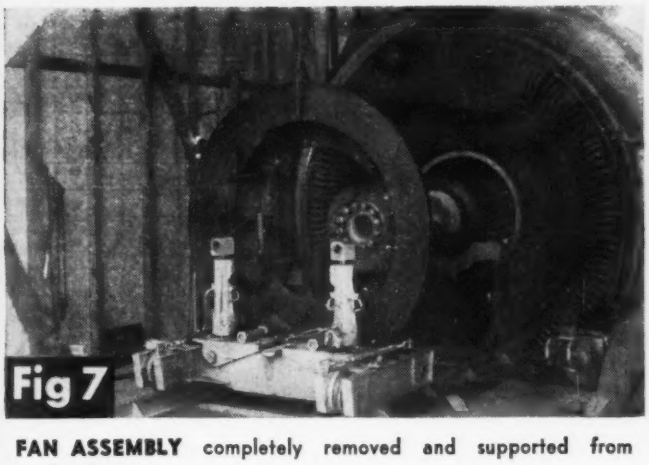
With carriages on each end of the shaft, and carriage frames securely connected to the rotor with tension rods, the entire assembly is moved



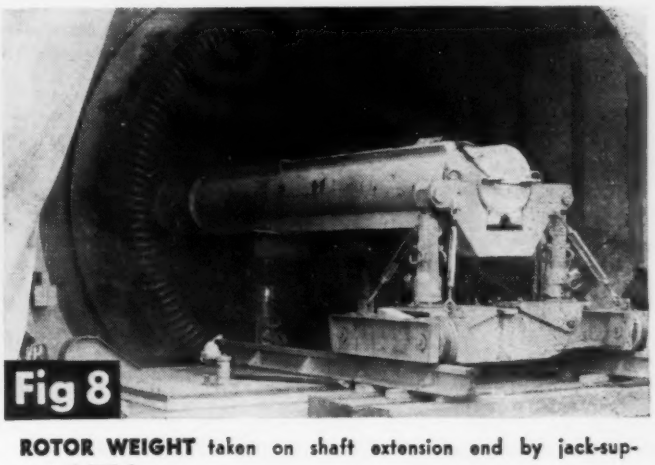

**SHAFT EXTENSION** is installed and rotor weight taken on jack-carriage assembly




**ROTOR WEIGHT** taken on carriage after bearing and pedestal are removed on other end of machine




**FAN ASSEMBLY** completely removed and supported from overhead sling




**ROTOR WEIGHT** taken on shaft extension end by jack-supported "I" beam

# Simplifies Heavy Rotor Handling

***Successive steps in removing 56-ton rotor with special equipment that reduces time required from seven to two days with fewer men and greater safety***

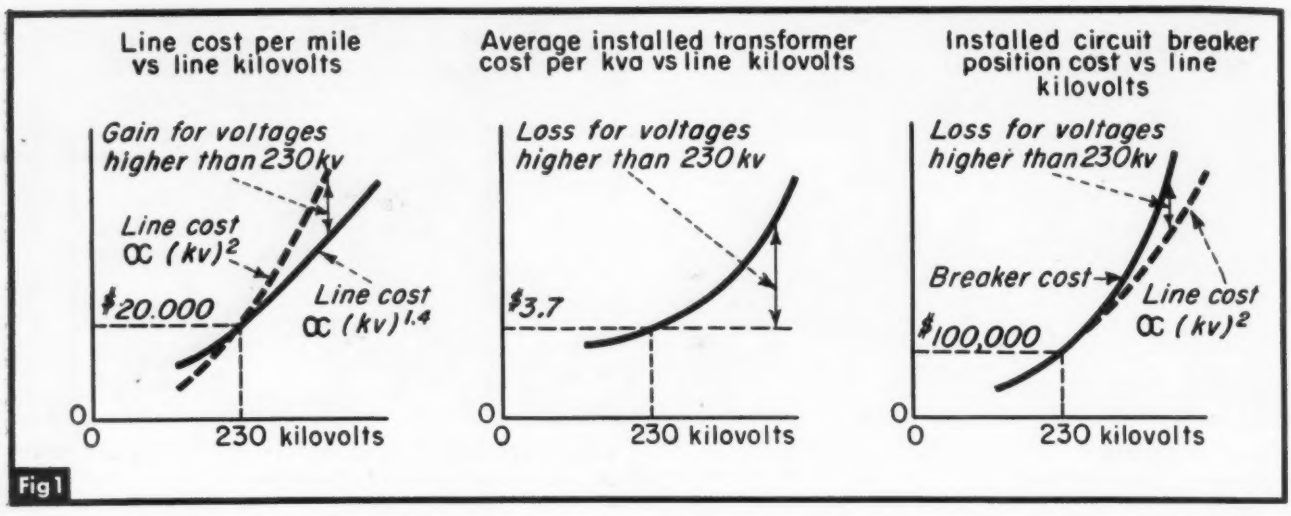
endwise until the rotor is clear of the stator. If the length of the track on the shaft extension end is limited by lack of footing, it is necessary to take the weight of the rotor on an "I" beam as shown in Fig 8. The carriage is moved out to the end of the shaft on the rails.

### *Rotating Rotor*

To revolve the rotor for inspection, the carriage on the shaft extension end is transferred to the other side of the stator. This is done by taking the weight on a jack-mounted yoke, as in the previous steps. To avoid damage to the shaft, the shaft extension is removed before placing the carriage-yoke assembly for rotating. In re-assembly, perfect bearing alignment is possible since the design of the jack footings permit the yoke to be shifted for side adjustment. This is done by slightly rocking the jacks on the hinged, setscrew-controlled, jack footings. This speeds realignment.

For overhaul servicing of a synchronous condenser as large as 35,000 kva, the Bonneville maintenance crew considers the dismantling operation a two-day job. Formerly, with conventional cribbing and rollers, it required seven days for this operation, and a crew of six men. Only four men are needed with the new method. This, of course, results in greatly reduced labor costs.

When it is not necessary to make detailed examination during dismantling, a 30,000- or 35,000-kva condenser can be completely dismantled for rotor servicing in 10 hr. These obvious savings are in addition to the reduced hazards to equipment and crew. With current heavy system loadings, the reduction of ten days in outage time is of paramount importance.




**RELATIVE COSTS** of line, transformer and breaker (the three most important elements of conventional overhead a-c transmission lines) as a function of line voltage. As can be readily concluded from these three sets of curves, the transformer puts a limit on high in voltage it is economical to go to obtain the lowest transmission costs per kilowatt

# Higher Interrupting Capacity

**S. B. CRARY**
General Electric Co
Schenectady, N. Y.

SWITCHGEAR and system design are closely related. Switchgear is built in line with system requirements and particularly important are those characteristics that merit incorporation in standard designs. Conversely, system design is influenced by the successful attainments of the switchgear designer.

The great influence of quick clearing time is well known. Before the days of quick clearing, systems were necessarily designed for long fault durations. Those were the days of "synchronizing-at-the-load," "isolated phase," "split-systems," etc. Reactors and system separation were used primarily to isolate the low-voltage area in the vicinity of the fault and secondarily to reduce the fault current. Now with the successful development of reliable, fast-operating relays, quick-opening circuit breakers, and the more recent addition of quick-reclosing for overhead lines, there is a change in emphasis—the trend of system design is toward a more solidly interconnected system at higher voltage levels. This simplified system design makes possible higher circuit loadings, less total transformer capacity, simplification of generating bus arrangements, reduced reserve generating capacity, reduced voltage dips due to suddenly applied loads, etc.

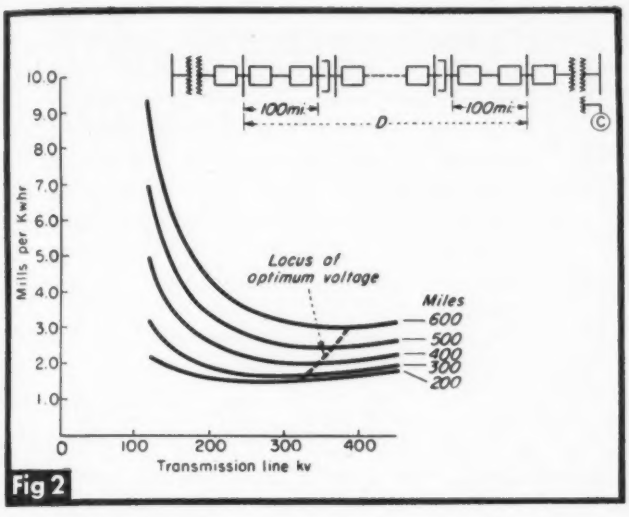
System costs are being reduced by making full use of reliable and quick-acting relays and switchgear. Apparently little additional system benefit can be expected from further reductions in clearing time. Quick clearing is a past accomplishment.

However, this accomplishment, along with ever increasing circuit breaker and relaying reliability, is exerting economic pressure for increased circuit-breaker interrupting capacities. Higher interrupting capacity is a problem now at hand, and one which can profitably be studied in order to anticipate and rationally prepare for the needs of power systems.

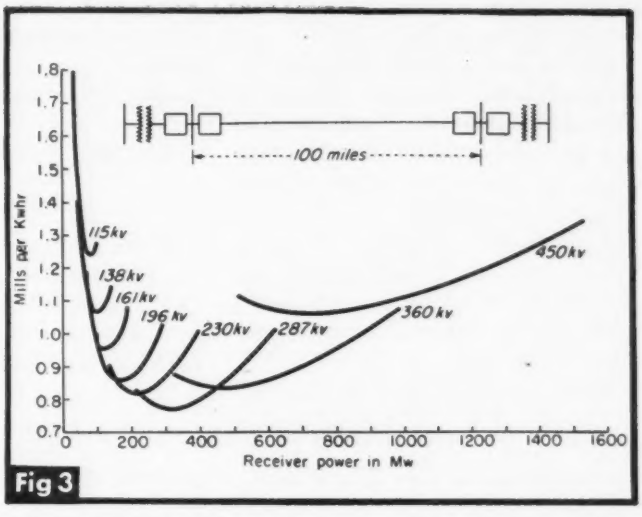
The following is a discussion of the results of some recent system studies and their correlation with the question of what are logical interrupting capacities for the future.

There is increasing interest in the higher voltages, continuing exploration as to the possible advantages of going above the present maximum of 287 kv. This is a natural consequence when forward looking engineers seek to plan their future system for greater circuit loadings and greater transmission distances. Whereas distance is a more important obstacle in countries less fortunate in natural fuel resources than ours, distance is also becoming a more important item of consideration even in this country. This problem can be simply viewed by considering the three most important investment elements of transmission; line, transformer, and circuit breaker costs in respective order of importance, keeping in mind that the kilowatt loading of the circuit varies about as the square of the line voltage. As can be concluded from Fig 1, the transformer puts a limit on how high in voltage it is economical to go to obtain the lowest transmission costs per kilowatt.

Fig 2 and similar results for other degrees of line compensation show that even for a 600-mile line (compensated with either series capacitors or special intermediate synchronous condensers) there is no further gain in going above about 360 to 400 kv. At such voltages the circuit loadings required for lowest transmission costs per kilowatthour would be 300,000 to 400,000 kw per circuit. If it is required to transmit only 120,000 kw per circuit 600 miles rather than 300,000 kw per circuit, it would of




**MILLS PER KWHR** vs line kv. Stations every 100 miles; conductor resistance 0.08 ohms per mile; line compensation 50 percent; load factor 50 percent; annual charge 11.5 percent




**MILLS PER KWHR** vs receiver power in Mw. Conductor resistance 0.08 ohms per mile; no line compensation; load factor 50 percent; annual charge 11.5 percent

course be more economical to use a lower voltage such as 230 kw, and as shown, without much increase in the cost of transmission per kwhr. Also, if it is necessary to tap the line for loads at intermediate points, the optimum voltages will tend to be less than those shown on Fig 2 for straightaway transmission.

From studies such as this, we are led to conclude that even for high circuit loadings at long distances, the foreseeable future will not require voltages in excess of about 400 kv, whereas for transmission in this country at distances presently contemplated, 287 kv is all that will be necessary for some time to come.

So much for long distances. What about more moderate distances? Fig 3 shows the transmission costs per kilowatthour for 100-mile transmission as a function of kilowatt transfer per circuit with voltage as a parameter. Here we find that 287 kv is the most economical of all the voltages and its best loading at this distance is 330,000 kw per circuit. Note how much less expensive it is to transmit electric power at the 230- or 287-kv levels than it is for example at 115 kv, provided the line can be fully loaded. A similar study for 50-mile straightaway indicates 230 kv as the most economical voltage with the best loading remaining at about 330,000 kw per circuit.

With improvements in reliability in transmission, there is less need for a multiplicity of circuits so that it now becomes possible to use fewer high-voltage circuits and realize a reduction in transmission costs. Circuit-breaker quick-clearing time and reliability has contributed greatly to this possibility. Such transmission systems will make full use of all modern developments, including reduced line and terminal insulation realized by the coordination of protective means and line shielding. Included in such systems will be stored energy circuit breakers (those not dependent upon arc energy for circuit interruption), grounded neutral overvoltage arresters, and voltage and power factor control using synchronous condensers and shunt capacitors.

These studies for distances from 100 to 600 miles are summarized in Fig 4, and show the possible cost of electrical energy transmission at 50 percent load factor and 11½ percent annual charge as a function of distance (100 to 600 miles). If the load factor can be increased from 50 percent to 100 percent the cost of electrical energy transmission a distance of 600 miles could be almost halved or reduced to about 1½ mills per kwhr, or roughly equivalent to the freight charges for transporting coal this distance. If the annual charges were less than 11½ percent the mills per kwhr could be reduced further, indicating new possibilities for electrical transmission worthy of careful consideration.

The conclusion to be drawn here is that power transmission offers new possibilities in those situations requiring the transfer of large blocks of power at high load factor. Furthermore, 287 and 230 kv appear to have real potentialities as important voltage levels for conditions which will prevail in this country. 115, 138 and 161 kv may very well be expected to be ultimately superseded by 230 and 287 kv as the backbone transmission voltages in the more developed areas of this country as the power to be transmitted goes up. This development, although necessarily requiring time, can logically be expected eventually to take place, but deserves consideration now, in order to prepare for such a transition.

Now what about the shorter distances? What are some of the economic factors for the transmission of power 20 miles and less? Fig 5 shows some of the economic factors per transportation of power by cable from one 15-kv bus to another. Circuit-breaker and cable-duct costs were not included in this simple comparison. Note that 23 kv is not justified as a voltage level in this case. From similar results for various distances, Fig 6 was made up to show the areas of economical transmission. This shows that if more than 20,000 kw is to be transferred a distance greater than about 5 miles, it becomes worthwhile to use a higher voltage. Note that 69 kv has an important place in such a picture over a wide range of loads from 30,000 to about 80,000 kw per circuit. This makes 69 kv an im-

portant voltage among the subtransmission voltage levels.

Similar sutdies have been made for overhead lines. However, the areas of economical overhead transmission vary appreciably with the type of construction, whether one or two circuits per tower are used, etc. The overhead case indicates that for distances greater than 5 to 10 miles, and loads about 15,000 to 20,000 kw, it becomes more economical to use a higher voltage than 15 kv.

Areas of economical transmission, as shown on Fig 6, are of course altered considerably by local conditions which are seldom as ideal as the simple case shown here. Such studies do point out, however, that with increasing loads and the necessity of locating generating stations farther from the load areas, the higher voltages can be expected to have a continually more important place in the subtransmission field as well as in major transmission.

Having reviewed some fundamental system economics, let us consider how this affects switchgear—and more particularly, interrupting capacity—since interrupting capacity is the one outstanding circuit breaker performance characteristic which is still under development.

Realizing full well the danger of forecasting, Fig 7 has been prepared to show the probable nature of the required circuitbreaker interrupting capacities as a function of voltage. It is realized that such a forecast cannot be accurate, but it does show the nature of the expected system requirements for interrupting capacity. This forecast was based on the following:

1. There appears to be very little need for higher than the 2½-million-kva capacity breaker already available at 15 kv, particularly in view of the trend to higher voltages for both cable and overhead circuits.

2. 69 kv can be expected to be a very important voltage level because of the wide range of loading of underground cable, either single or three conductor. It can be expected that this voltage level will in the future require at least 3½ million kva.

3. 138 kv is an important overhead voltage and may have increasing importance for heavily loaded circuits both overhead and underground in the range of 50,000 to 150,000 kw per circuit. As the voltage goes up, the blocks of generation and load go up so that it can be fully expected that some thing in the order of 5 million (kva) will be required at 138 kv.

4. At the higher voltage levels, 230 and 287 kv will become more important. These may very well become the major backbone voltage levels of this country, and it can be expected that the required interrupting capacities may be about 10 million kva.

5. Higher voltages than 287 kv will be used only for long straightaway distances and there will be no necessity for higher interrupting capacities than those required at 287 kv.

It is very significant that none of these higher interrupting capacities exceed 25,000 amp except for voltages below 138 kv. At 25,000 amp, 287 kv is more than 10 million kva and should provide sufficient interrupting capacity for a 2-million-kva hydro plant interconnected at this voltage.

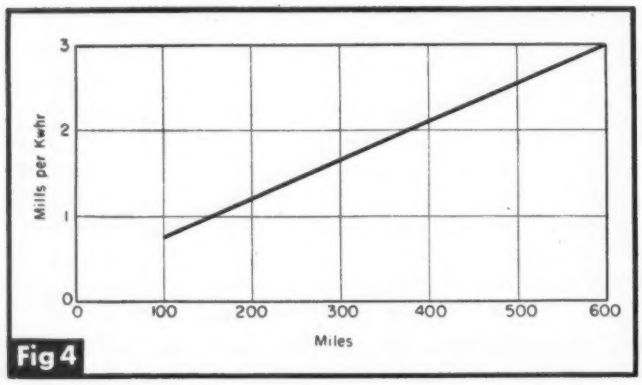


Fig 4

**COST** of electrical energy transmission; 200 to 300 Mw per circuit, load factor 50 percent, annual charge 11.5 percent

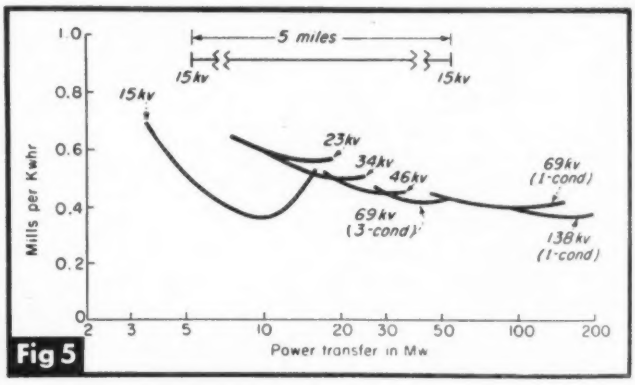


Fig 5

**TYPICAL COST** of energy transmission by cable vs power transfer; distance taken as 5 miles

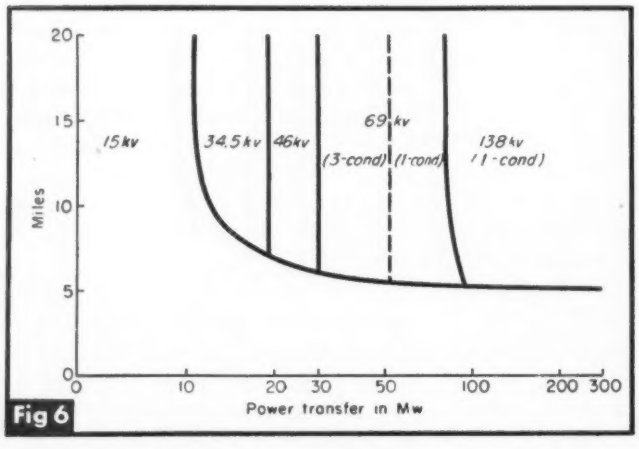


Fig 6

**RELATIVE AREAS** of most economical cable transmission under typical situations

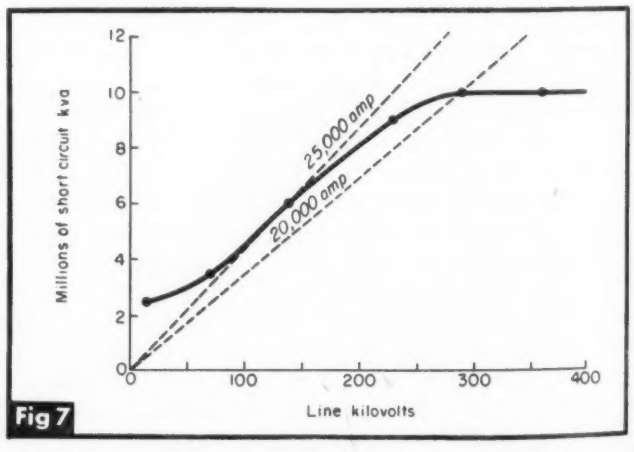
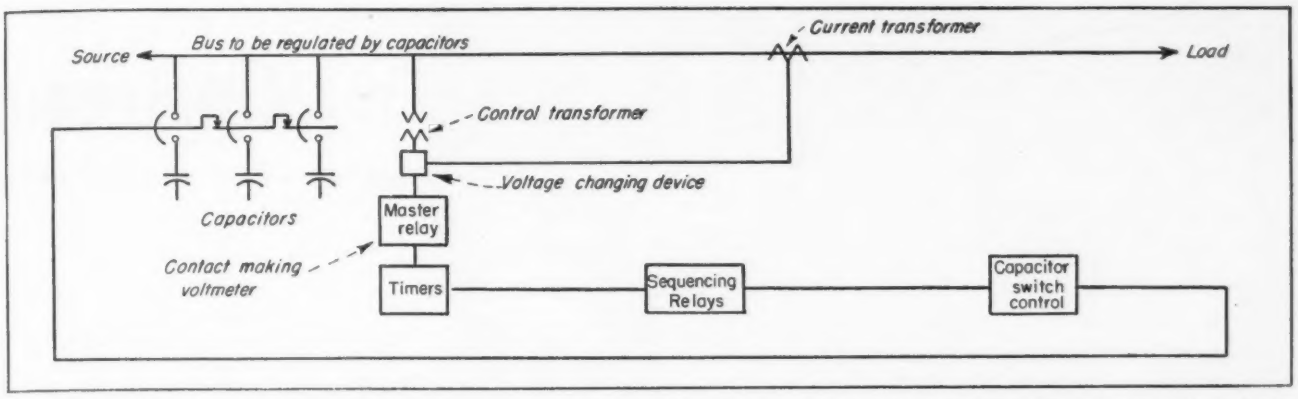


Fig 7

**TREND** of approximate expected future system interrupting capacity requirements




**CAPACITORS SIMPLY CONTROLLED** by current and voltage. The voltage-changing device increases voltage relative to bus voltage on main coil of master relay with decrease in load. This scheme has advantages over conventional methods

# Switched Capacitors Back Bus Regulation

**F. M. REED**
Assistant Electrical Engineer
Pennsylvania Electric Co
Johnstown, Pa.

CAPACITORS can be controlled by a contact-making voltmeter, used as the master relay of a sequencing scheme. The voltage regulation obtained, even on a bus-regulated system, has points of superiority over either conventional voltage or current control of capacitors.

Calculating board studies have indicated that over 60,000 kvar of capacity are needed in various areas in the system; also that the cost would be self-liquidating on the basis of the reduction in line losses and the release of kw and kva capacity in generating stations and substations.

Static capacity must be so controlled as to be off the system at times of minimum loads. This is necessary to avoid system instability because of the large amount of transmission line capacitance in proportion to the system load.

Since the generator bus voltage on the system is automatically regulated to vary with the load, conventional voltage control of capacitors would be unable to meet the requirement in locations most influenced by generator bus regulation. Also the capacitor with voltage control would tend to nullify the effect of generator bus voltage regulation.

Manufacturers of capacitors felt that either voltage or current control, with the additional possibility of manual, supervisory or time clock control, could be applied satisfactorily at any given location.

The functions that the capacitors were expected to perform are:

1. Relief for generating stations and substations.
2. Improved system regulation.
3. Avoid construction of new lines for either normal or emergency service to certain areas.
4. Capacitors to pay for themselves in the reduction in line losses.
5. Improve the regulation in the immediate area or at the particular substation to certain areas.
6. Dispersal of the capacitance among substations, placing a moderate amount at each substation.
7. Eliminate need for regulators.
8. A minimum voltage range in which the capacitors will function during "emergency" conditions.

A simple control scheme was designed to make capacitor installations more practical and advantageous at many locations than they are at present.

The plan consists of controlling the voltage on the actuating coil of a contact-making voltmeter, which is the master relay of either a one-step or sequencing-voltage control system, by a current transformer placed on the load side of the capacitor-controlled bus. Each manufacturer to whom this plan was submitted has worked out his own modification of it. No change in any control system beyond the master relay is either planned or required.

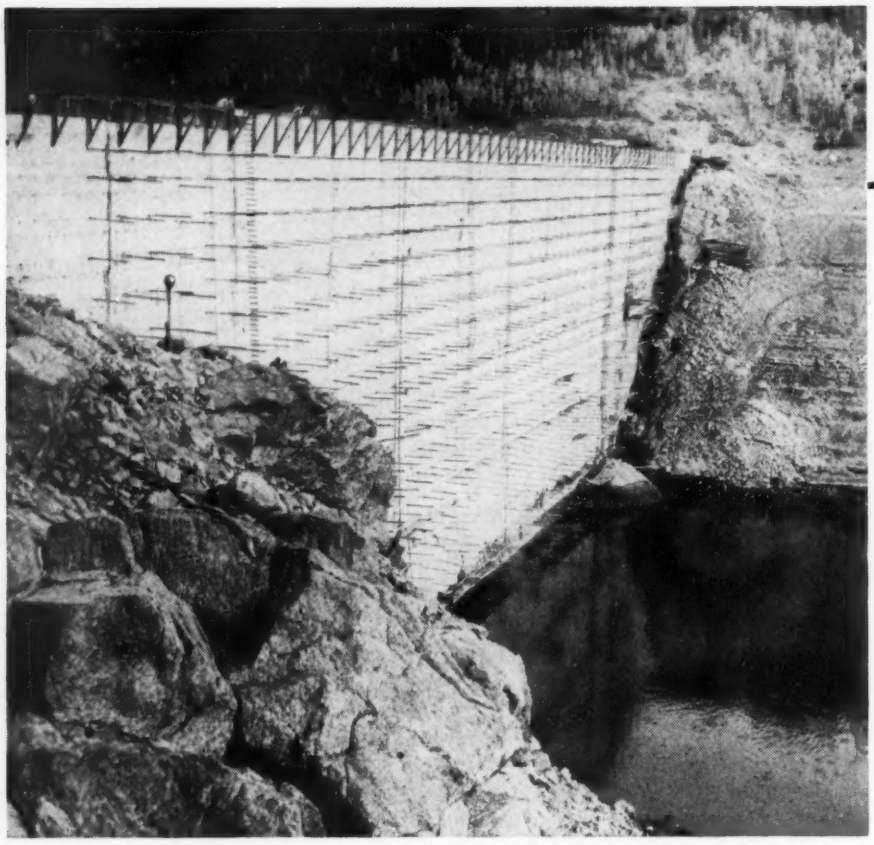
This device indicates certain bus voltages to the master contact-making voltmeter under medium to high loads. When the load is low and the capacitors are required to be off the line under any but exceptional conditions, the voltmeter is given a higher voltage indication with relation to actual bus voltage. This arrangement is expected to have the following advantages:

1. Because automatic control provides for all limiting conditions, the capacitors can be widely dispersed at the most advantageous locations.
2. With a sequencing arrangement the capacity will have a regulating effect on the individual substation. This will tend to supplement and correct the effect of generator bus voltage regulation at that point.
3. The capacitors will come on in a non-simultaneous manner with increasing load and drop off with decreasing load, thus acting as a system regulator to work in conjunction with generator bus voltage regulation.
4. All capacity will be off the system during light load periods except where a substation load does not follow the normal system load curve or where low voltage occurs during periods of abnormal system conditions.
5. This control system provides an "emergency" low range of voltage control for each substation under light load conditions which will put the substation under the influence of the capacitors if the light load voltage falls below a certain point due to line outages or other causes.

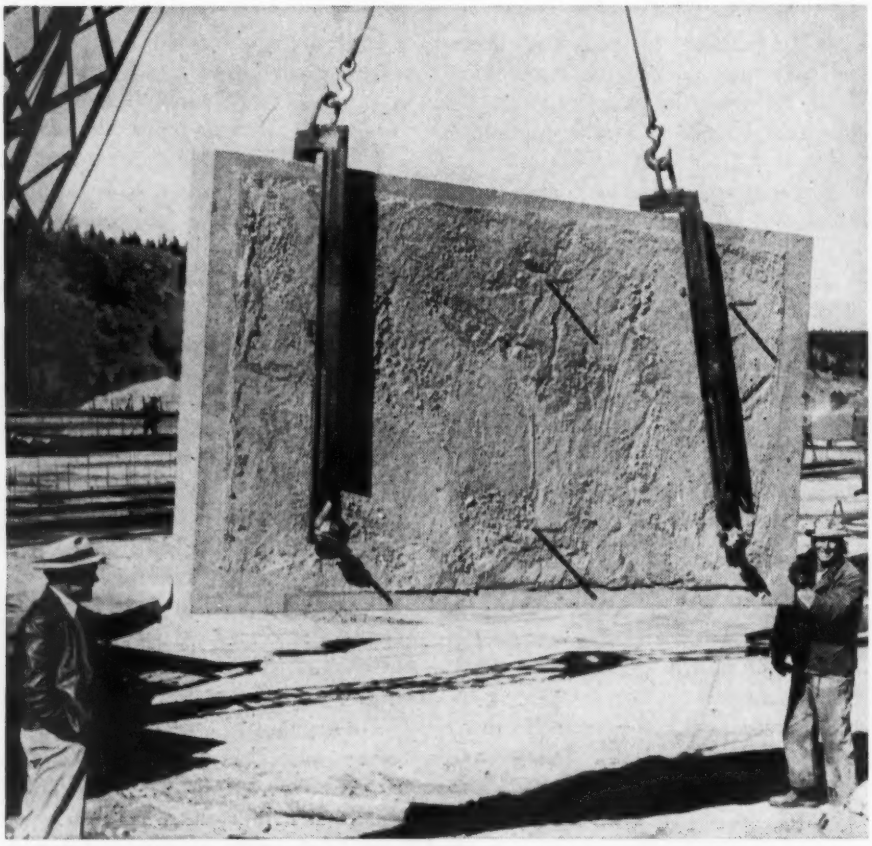
# Upstream

**L. B. CARD**
Mechanical Engineer
Hydro and Transmission Engineering Dept
Public Service Co of Colorado
Denver, Colo.

Photographs by Horace Selby†



**UPSTREAM FACE OF BARKER DAM,** showing chippers at work on scaffold just above the water. Steel anchor rods are in place at extreme left of the face



**PRECAST SLAB OF REINFORCED CONCRETE** suspended vertically by inverted J-hooks attached to crane sling. This is the method of handling for final positioning of the slabs on the upstream face of the dam. Lower end of each hook is recessed and catches under the bottom corner dowels

AFTER thirty-six years of service, the reservoir behind Barker Dam of the Public Service Co. of Colorado has been emptied and the upstream side of the dam refaced. This project required 1,000 precast concrete slabs to be cemented to the eroded face. During the job, the stream flow was diverted through a 24-in. diam pipe line extending through the bottom gate.

The refacing consisted of four major steps: (1) Existing face chipped down to sound concrete and sandblasted; (2) approximately 6,000 holes drilled in the face into which 1-in. diam steel rods are grouted; (3) erection of the precast concrete slabs measuring 6½ ft x 12 ft and weighing 4 tons each, and attached to the dam by the steel rods projecting from the face; (4) space between the face of the dam and the slabs filled in with concrete to make the mass a solid unit.

Chipping and drilling operations on the face were performed from suspended scaffolding as well as from pontoon-supported platforms floated on the water. The water was gradually drained to the bottom gate level and all water below that level was released through a 4-ft x 6-ft drainage tunnel. This tunnel was 120 ft long and driven through the base of the dam. The scaffolding measured 600 ft across the face and extended from the bottom to the top of the 170-ft dam. It was suspended by steel cables but not otherwise fastened to the dam. The scaffold platforms were moved from one level to another as the work progressed.

The precast slabs are 8 in. thick

† Staff Photographer, Public Service Co of Colorado

# Face of Dam Refaced with Precast Slabs

***Unique construction project involves draining of reservoir and chipping and drilling dam face . . . 1,000 precast concrete slabs are cemented to face to renew surface***

and are reinforced to withstand a load of about 25,000 lb per slab on either face.

Six steel dowels project 9 in. from the back face of each slab. The slabs were stored flat with the back face up until ready for placement. At time of placement, they are picked up by the four corner dowels and placed on a flat-bed truck. Upon arrival at the dam, the slab is lifted off the truck by a crane and placed without further handling. Two hooks on a cable sling are used for this purpose. The slab hangs vertically after being lifted from the truck. These hooks are shaped like an inverted letter J, placed with the short leg on the outside face of the slab and the long leg on the inside face. The end is hooked under the bottom corner dowels.

When the slab is in final position, the dowels projecting from the inside slab face are welded to the dowels extending from the face of the dam and the hooks are removed. The weight of each succeeding slab is carried by the one immediately beneath. It is held in place laterally by the dowels. The joints between the slabs are filled with grout.

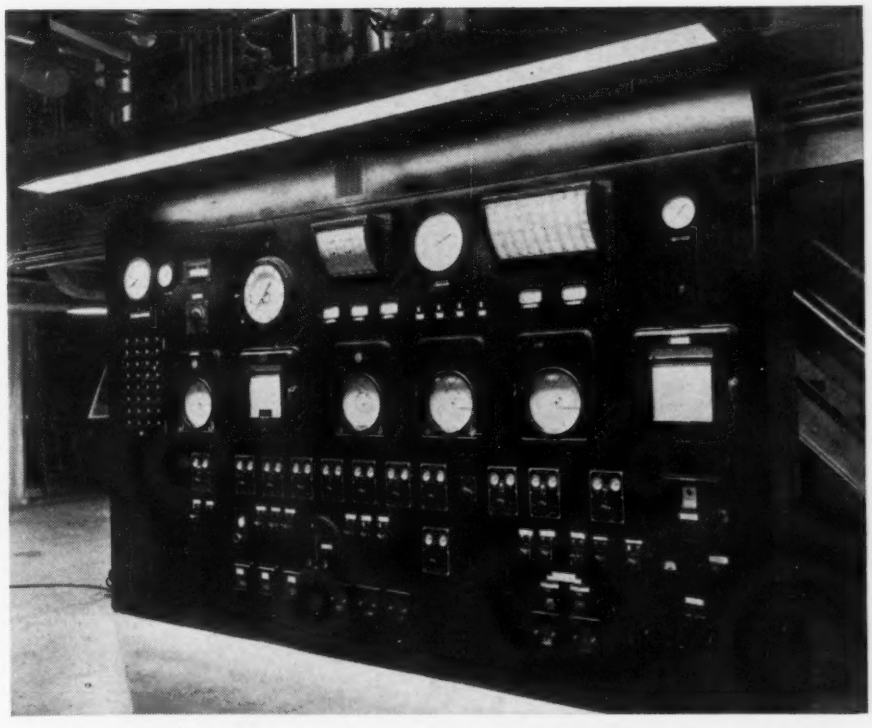
The precast slabs were placed by crane from the reservoir bottom as high as the reach of the crane would permit. The remaining slabs were lowered into place from the top of the dam. Filling the space between the face and precast slabs with dry Prepakt aggregate kept pace with the erection of the slabs. But the grouting was not started until all slabs and aggregate had been placed and the reservoir filled. Grouting continued without interruption until the entire face was completed.

The project cost over $665,000. Raymond E. Davis, consulting engineer, University of California, Berkeley, prepared the plans and specifications and supervised the engineering.

## How to Light a Boiler Control Board

LIGHTING of a boiler control board at the new Mystic station of the Boston Edison Co, consists of 26 100-watt tungsten lamps mounted about 6 in. apart in a housing 14 ft 4 in. long. This housing is equipped with Holophane No. 732 controlenses (square) set at an angle of 18 deg from the horizontal. Outer edge of trough is 2 ft 1⅛ in. distant from face of board; control board is 8 ft high and top of housing 9 ft 6 in. above floor. Housing opening is 6½ in. deep at outer side and there is an opening 9¼ in. wide at the bottom of the housing. Illumination averages about 40 ft-c. The face of the board is black, and the instrument charts white.

Details were developed by Walter L. Ball of the Stone & Webster Engineering Corp, Boston. The housing was built by the G & N Engineering Co, Boston. Jackson & Moreland, Boston, are the designing and construction engineers for Mystic station.



**INCANDESCENT FIXTURES IN HOUSING** effectively illuminate control board.

# Longer Cable Pulls Halve Costs

R. G. FINNERTY
Engineer
Boston Edison Co, Boston, Mass.

INCREASED PULLING LENGTHS for transmission line cables should result in lower installation costs. Twenty years ago, transmission cables were installed in lengths of 300 to 400 ft in ducts 3 in. to 3½ in. diameter. A 350-million-cir mil, 15-kv, 3-conductor cable was 2.65 in. outside diam and weighed 9.5 lb per ft. This diameter was 88 percent of the diameter of the 3-in. duct; 76 percent of the diameter of the 3½-in. duct. The pulling stresses were calculated on the basis of a pulling coefficient of friction of 0.5. For a 400-ft section this resulted in a stress of 1,900 lb. Today, with a fiber duct, carefully installed and well lubricated, a pulling coefficient of 0.3 is obtained.

Installation of the 115-kv oil-filled cable line between Boston Edison's Mystic station and Woburn had coefficients of friction on the first 127 sections divided as follows: 81 percent less than 0.35; 11 percent between 0.35 and 0.50; and 8 percent above 0.5. The higher values occurred before adopting a technique of restarting slowly after a stop and the use of a feed and greasing trough.

From this it is apparent that a modern cable of the same rating (350 M cir mils) with an outside diameter of 2.3 in. and weight of 7.8 lb per ft, could be installed in 1,000-ft lengths with a pulling stress of only 2,340 lb. Since our standard duct size is now 4 in., a new duct line of this size will allow for future cable sizes up to 800 M cir mils. A 1,000-ft length of 800-M-cir mil, 3-conductor, 15-kv cable should be installed with a maximum tension of 4,300 lb. It is assumed that any section installed with pulling stresses below 4,500 lb can be removed with available equipment capable of applying pulling forces of many times that value.

Consider the problem of installing two new 3 x 350-M-cir mil, 15-kv lines, 10 miles between substations in new ducts. The relative costs of this job, based on 450-ft and 1,000-ft sections, are given below. Duct costs are assumed to be the same for either installation. Major differences will be in manhole costs, cable installation and jointing:

450-ft Sections—Installation Costs

Construct 117 manholes, install 236 sections of cable, make 234 joints and provide fireproofing—$119,180

1,000-ft Sections—Installation Costs

Construct 52 manholes, install 106 sections of cable, make 104 joints and provide fireproofing (Cable installation costs assumed to be 50 percent over 450-ft sections) —$57,880

This shows a saving of $61,300 in first costs.

We can now estimate our maintenance costs on existing failure rates.

Fewer manholes mean less trouble. They are a source of trouble from joint failures, defective wipes, sheath breaks due to cable movement and mechanical damage. Longer sections reduce the total number of troubles but cost more to repair. The expected trouble rates of short and long sections are:

Duct failures—Rate per section of cable per year

| | |
|---|---|
| 450-ft sections | 0.0021 |
| 1,000-ft sections | 0.0046 |

Increasing length of section will probably increase the rate of duct failures per section. This is because of increased exposure to mechanical damage and deterioration. However, the rate will probably not increase directly as the length. But to make no questionable assumptions, the rate for 1,000-ft sections has been increased by the ratio of 1,000 to 450.

Cable failures in manholes—Rate per section of cable ..... 0.00116

Joint failures—Rate per joint ..... 0.00172

Maintenance cost can be computed by multiplying the cost of each type of failure by its failure rate and the number of sections of cables or manholes as the case may be. The cost of a cable failure includes the cost of locating the failure, material including salvage value and labor to replace one section of cable and the labor and material to make two joints. The cost of a joint failure is weighted to include necessary cable replacements and therefore is greater for 1,000-ft sections.

Reducing the number of manholes per mile of cable will produce other savings. Among these are the cost of manhole inspection, costs of regulating manholes and maintenance costs of covers and frames.

Annual maintenance costs, 450-ft sections:

| | |
|---|---|
| Total annual costs of failures in ducts, manholes and joints, 10-mile double cable line ..... | $ 505 |

Annual maintenance costs, 1,000-ft sections:

| | |
|---|---|
| Total annual costs, for above items ..... | $ 524 |

Total annual costs, 450-ft sections

| | |
|---|---|
| Capital charges, 10 percent of investment... | $11,918 |
| Annual maintenance costs | 505 |
| | $12,423 |

Total annual costs, 1,000-ft sections

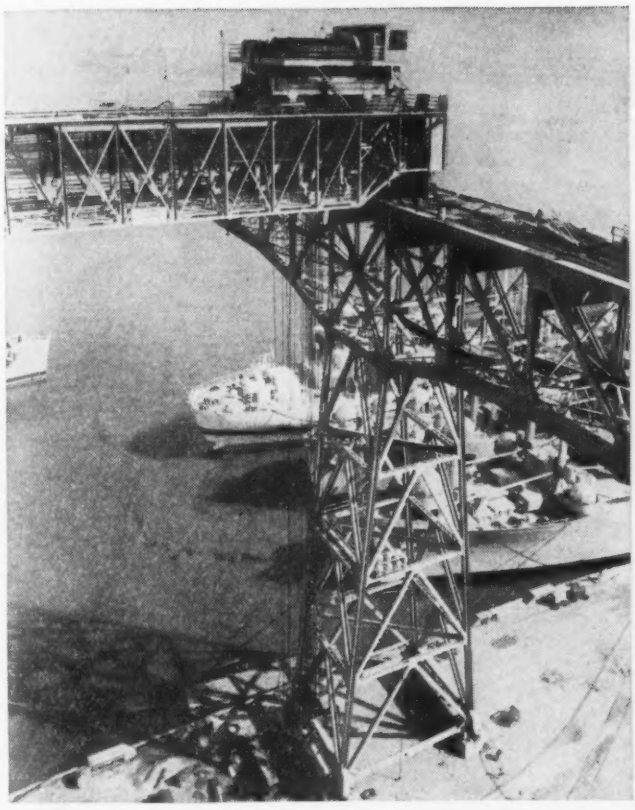
| | |
|---|---|
| Capital charges, 10 percent of investment... | $ 5,788 |
| Annual maintenance costs | 524 |
| | $6,312 |

Total annual savings, 1,000-ft sections ..... $6,111

The 50 percent saving results from greatly reduced installation cost. The maintenance cost of either short or long sections is nearly the same, and in either case, is only a small part of the annual capital charges.

Trouble involving cable replacement on this 10-mile double line would theoretically occur once every 1.36 years. During these periods a saving of $8,350 would accrue.

* From a paper before the Underground Distribution Engineers of New England presented June 5, 1947.



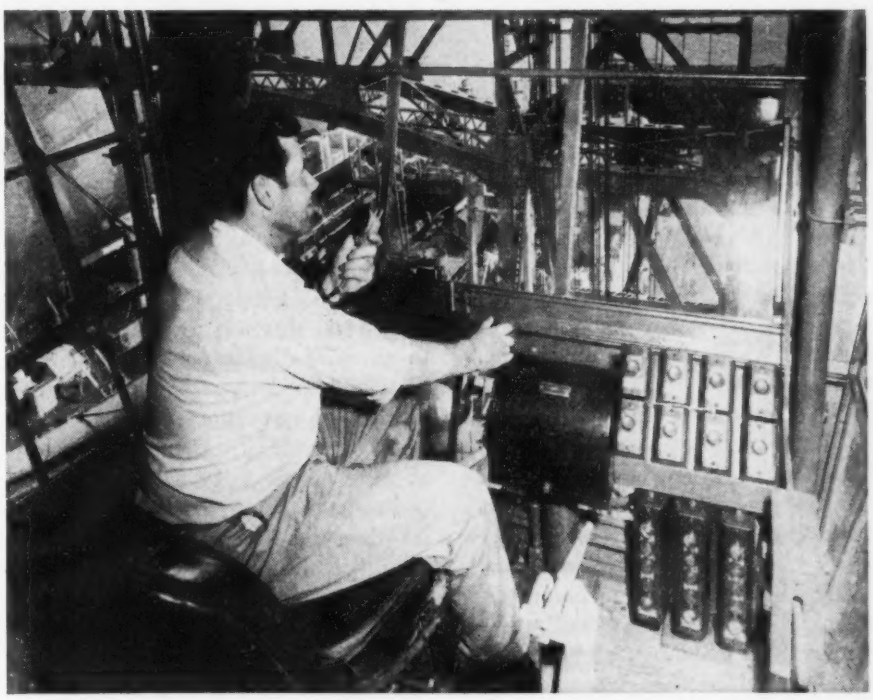
**ONE END** of one of the bridges showing hoist works on top. Cantilever structure projects out over bay 162 ft with clearance of 182 ft over the water

**WORLD'S LARGEST CRANE** lifts 500 tons at speed of 10 ft per min. Movable cross bridges are connected together with equalizer beam between hooks for maximum capacity

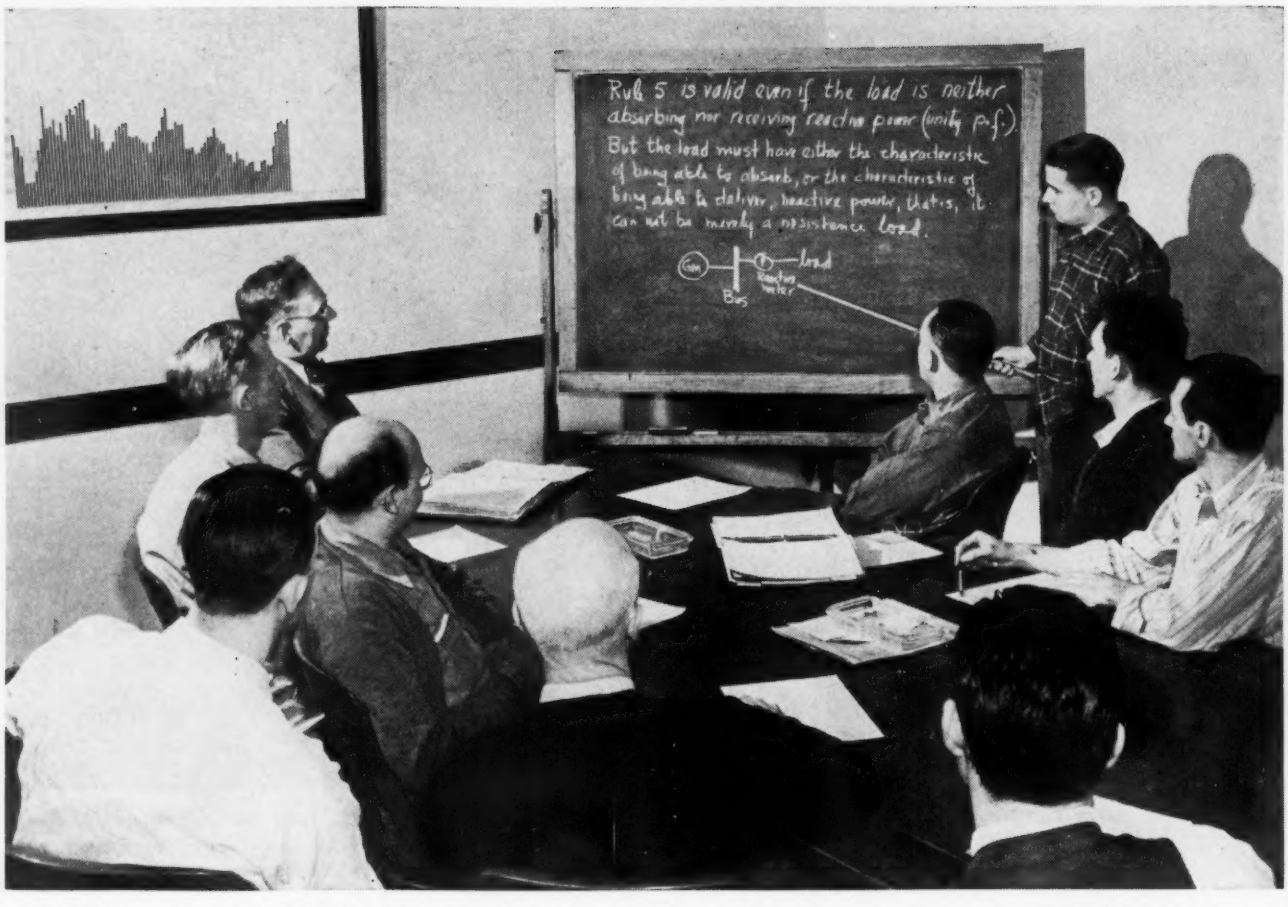
# Giant Crane Has Cross-Flux Control

THE WORLD'S largest crane is now a part of repair facilities at San Francisco Naval Shipyard, Hunter's Point. Rails on which the two cross bridges operate are 176 ft above the wharf. Total length of the stationary bridge structure is 730 ft. Power supply is from two 12-kv cables to a 1,000-kva transformer bank on one of the crane legs. Feed to rail contacts is at 480 v, three phase, a-c. Sliding shoe contacts on each bridge connect to control cab.

The four travel-motors on the bridges are 50-hp, wound-rotor induction motors; on the travel for the hoist works is a motor of the same size and type. A three-unit motor generator set with 400-hp a-c motor driving two 125-kw, 230-v d-c generators and a 20-kw cross-flux exciter supplies d-c power for the hoist motors. These are two 135-hp, mill-type, 230-v d-c units. GE cross-flux control provides hook speed inversely proportional to load.



**OPERATOR IN CONTROL CAB** is in constant communication with crew by microphone and loud speaker in cab and walkie-talkie set below. This communication and visibility provide more flexible control


Rule 5 is valid even if the load is neither
absorbing nor receiving reactive power (unity P.F.)
But the load must have either the characteristic
of being able to absorb, or the characteristic of
being able to deliver, reactive power, that is, it
can not be merely a resistance load.
Gen
Load
Reactive meter
Bus

**CLASSROOM WORK FOR OPERATORS** on the relation between voltage and reactive power in company-sponsored training course

# Train Operators to Dispatch

**EDMUND R. PAIGE**
Buffalo Niagara Electric Corp
Buffalo, N. Y.

CONSTANTLY increasing loads are forcing electric utilities to review means for making maximum use of energy capabilities of generators and other equipment. On any system the load always has a power factor less than unity. For greatest energy utilization it can be regarded as comprising two components: Energy, the "active power" load; and non-energy, the "reactive power" load. Each component causes heating in conductors, machines and other equipment. Each contributes to voltage drop. Both must be produced and handled in the system. Their proper assignment is a determining factor in efficient system performance.

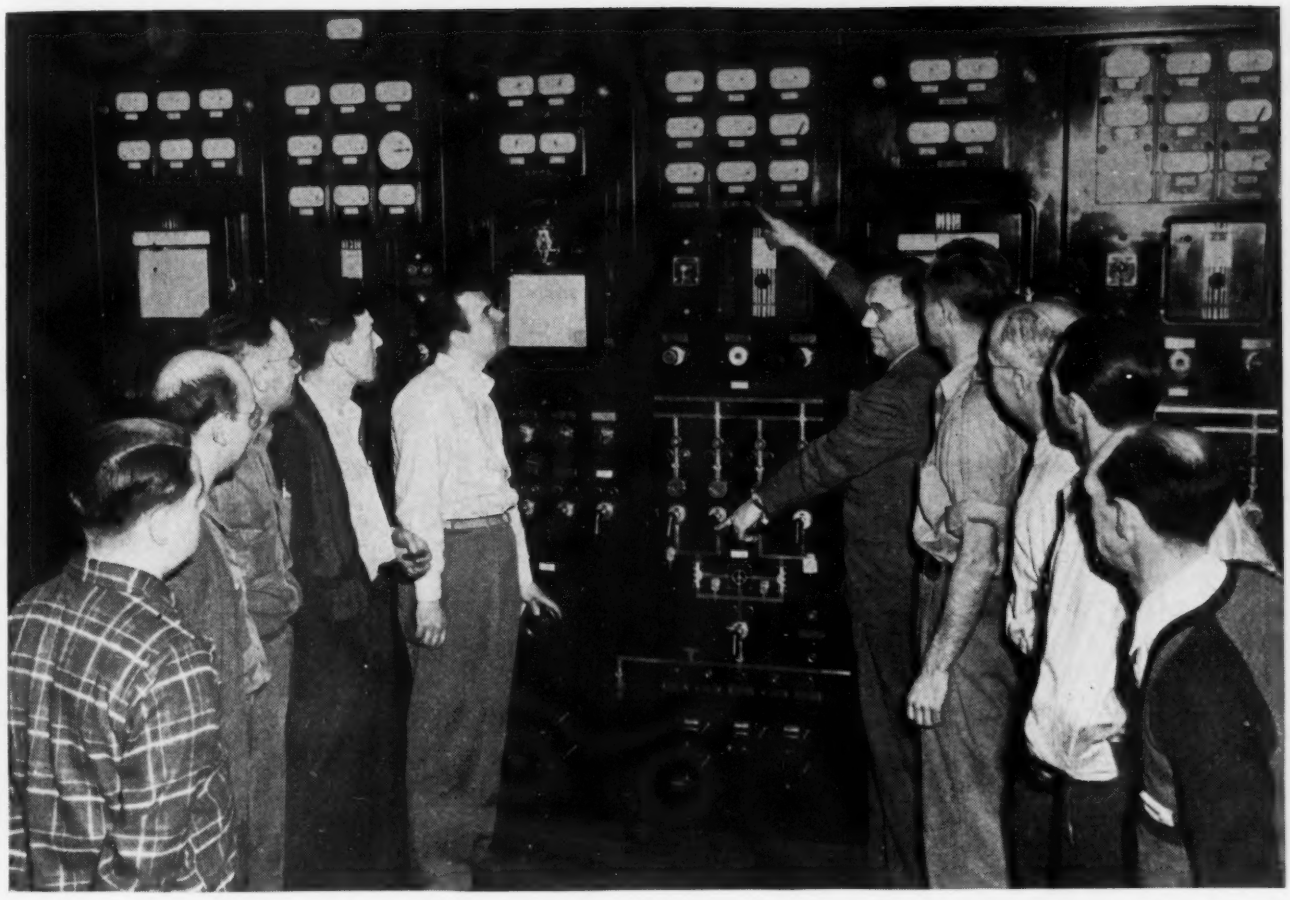
A training program for operating personnel of the Buffalo-Niagara system stresses this concept and teaches the most effective ways for handling reactive power.

The training was given to each principal operator at stations having rotating machinery or load-ratio controlled transformers. It was also given to all chief operators, district operators, and load dispatchers. It is important to have the program sponsored by those of the operating force of the rank of superintendent, and to have them participate actively, for then the operating instructions will reflect the teaching.

Classes were held in the daytime—five meetings of two hours each for each man. The men attended class on their days off, and were paid for time spent. Each group was limited to about ten men to promote discussion. The classes were held in the various stations. This related instruction more closely to daily work.

By experience, the lecture system was found unsuccessful. The discussion, or question-and-answer method was used. This vitalized the work and held the men's attention. A set of basic general questions plus others peculiar to that particular part of the system was prepared for each class. The answering of these questions, with accompanying discussion, formed the class work. A text written by the operating department heads supplemented the course. The operators studied this text outside of class when opportunity afforded. Whenever practicable, demonstrations were performed on actual equipment. These supported the classroom discussions.

For the purpose of instruction and of operation in the Buffalo-Niagara system, there is only one kind of reac-



**REACTIVE POWER CONTROL** being demonstrated to operators. Groups were limited to about ten men each

# Reactive Same as Active Power

tive power. It is defined as follows: Reactive power is that required by an inductive load. It is the kind of reactive power whose delivery *from* a generator *to* an inductive load increases as the field current of the generator is increased.

Operators are taught to consider reactive power as a separate entity. By adjustment of controls, it can be made to flow either towards or away from a bus. Thus it is possible to have reactive flowing in one direction and active power flowing in the other direction in a line.

Before considering the relation between voltage and reactive, the economy gained by having the generation of reactive as close as possible to its point of consumption was explained. The operators were instructed to dispatch reactive throughout the system as a separate item and over the shortest distance generally possible.

Generators can produce both reactive and active power. However, when this is done, heating of the generator windings is caused by the reactive as well as by the active power. While it is generally more economical to produce both reactive and active power in the same machine, there are cases where only active power should be produced by the generators, the reactive being produced by synchronous condensers. This means that it is more economical at times to reduce excess heating by reduction of reactive power output and leave the active undisturbed. Such an instance is illustrated by the large hydrogenerators at Niagara Falls. There, the water passed through the hydro-turbines produces energy, but if the same water is allowed to pass over the Falls, the energy is lost. If the limiting temperature of a generator is being exceeded when carrying both active and reactive power, some possible active power will be sacrificed unless the generation of reactive is reduced.

After instruction, the operators at Niagara Falls did make more active power available by correctly applying this rule. The Niagara Falls generators must supply some reactive power when the system is heavily loaded. In hot weather this causes a limiting temperature to be reached by the end of the heavy load period, and the generator current has to be reduced. To make full use of the water power, the active power is maintained as the light load period comes on. Cooling of the generators during the night results from reducing the reactive power to zero. Steam-electric units and condensers furnish the reactive during the night.

The operators were next taught the relation between voltage and reactive power. They were shown that the correct voltage at the various buses is obtained not only by observing voltmeters, but by observing reactive meters as well. The rules for this require qualification.* The best training technique introduced these rules in their simple form; later, the qualifications were discussed.

To raise the voltage of a bus, manual adjustments are made to send more reactive power towards the bus. (The corollaries of this for reactive initially flowing away from the bus and for lowering the voltage are evident.) These manual adjustments are: For rotating machines; an increase in field current increases the reactive "to bus." This raises the bus voltage. For load-ratio controlled transformers; an increase in tap number (e.g., from tap 2 to 3) increases the reactive power towards the high-voltage bus and increases its voltage. (The full low-voltage winding is tap 1 universally.)

The interchanging of true cause and effect does not trouble the operators; but the following interpretation is sometimes needed.

Consider the initial conditions shown in Fig 1. If, subsequently, load conditions change and the reactive meter indicates 20 instead of 18 kvar, the load bus voltage will fall due to the increased voltage drop in the line and the constant generator bus. This apparently contradicts the rule that more reactive power is sent towards the bus to raise the voltage of the bus. However, the rule is worded on the basis of a constant requirement of reactive by the bus in question. On this basis, more reactive must be sent towards the bus from a source of reactive in order to raise the voltage. To do this a manual adjustment must be made at the generator regulator. If the demand for reactive is increased to 20 kvar and the depressed voltage is desired to be raised, a still greater amount of reactive, say, 22 kvar, must be sent in order that the load bus return to its initial voltage. Thus, a still greater adjustment must be made in the generator field current, and the bus voltage cannot be kept constant.

In the case of Fig 2, 10 kvar is flowing towards the bus and 10 kvar is flowing away. If the reactive flowing from the generator towards the bus is increased to 12 kvar, with a constant demand of reactive by the line, the voltage of the bus should rise according to the explanation above. The reactive meter "a" will indicate 12 kvar "to bus," but meter "b" will indicate 12 kvar "from bus." From this, it appears that meter "a" supports the explanation and meter "b" opposes it. However, the explanation above applies only to the reactive meter that lies sandwiched between the bus whose voltage is to be raised or lowered and the apparatus whose adjustment is to be changed.

These principles can be shown in a typical operating problem. Consider Fig 3. Assume that the voltage of the 66-kv bus is to be raised. The conditions are: Each of three generators has the desired kw which is not to be changed; Generator 6 is delivering as much reactive as possible (fully loaded); Generators 1 and 2 can carry more reactive; and the generators are each on automatic voltage regulation. If each of the four banks is on tap 4 (tap 1 is the full low-voltage winding), the following adjustment would be made to raise the 66-kv bus voltage and maintain the 12-kv and 22-kv unchanged.

Banks 10 and 20 each would be changed to tap 5. This would merely load Generators 1 and 2 with more reactive and reduce the reactive load on Generator 6. It would leave all buses unchanged in voltage, since the generators' voltage regulators were not changed. Banks 1 and 2 would each be changed to tap 5. This would increase the voltage of the 66-kv bus, reloading Generator 6 with reactive.

It should be noticed that the tap-change in Banks 1 and 2 sent more reactive towards the 66-kv bus and raised its voltage. This is because it was an unregulated bus; the increased reactive sent to the 22-kv bus did not change its voltage since it was a regulated bus.

*The practical qualification applies to a regulated bus. Such a bus will remain approximately constant in voltage, even though the amount of reactive flowing towards or away from the bus is changed by making manual adjustments to rotating machines outside the influence of the regulators. For those machines inside the influence, a manual adjustment of the regulators for a higher bus voltage will simply increase the field current. This results in more induced voltage in the machine and a greater reactive power flow towards the bus.

The academic qualifications are: (1) The load cannot be merely resistance, since no reactive power can be delivered to such a load; (2) nor can the load be merely capacitance. These kinds of loads are far removed from actual conditions on a power system where the inductive reactive power demand by the consumers and the system is about as great as one-half of the active power demand.

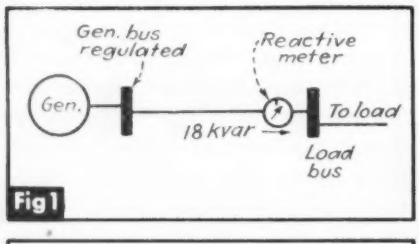


Fig 1

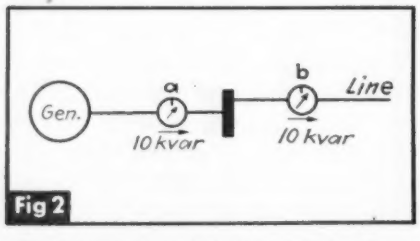


Fig 2

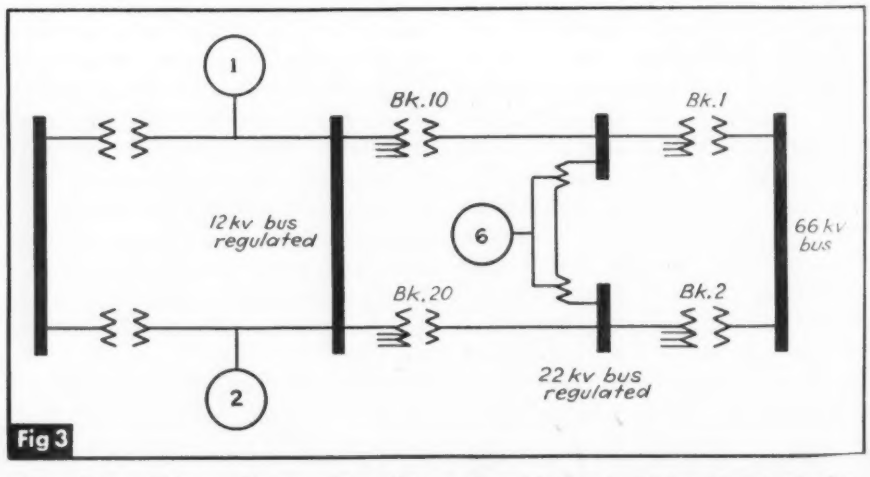


Fig 3

**CIRCUIT DIAGRAM** (Fig 1) showing initial conditions before load changes. If load changes, load bus voltage will fall due to increased voltage drop in line and to constant generator bus also.

Diagram of conditions where 10 kvar is flowing towards the bus and 10 kvar is flowing away (Fig 2). Typical circuit diagram (Fig 3) of operating problem where voltage of 66-kv bus is to be raised

# Tailored Financing for Utilities

THE ELECTRIC POWER INDUSTRY is attempting to increase its generating capacity by about one-third in a five-year period. Already, this has brought some concern as to financing. This concern has been heightened during recent months by the stock market's sluggish reaction to common stock issues.

As they seek the answer to financial riddles, smaller systems may find a solution in the lease-purchase agreement by which one Midwestern system obtained almost $4,000,000 worth of equipment which was, essentially, financed by its manufacturers.

The company in question needed a new, small generating station. It had not the funds to build it, nor could it raise them through conventional financing. It approached—largely on a personal basis—three manufacturers, asking to "lease-purchase" a turbine, a generator, a condenser and the necessary piping. After considerable "education," a contract was agreed upon and the equipment installed. Later, two other lease-purchase agreements were entered into. The largest was for equipment costing $1,300,000. The three totalled $3,400,000. Nine manufacturers were involved in the three transactions.

Officers of the company emphasize that their problem—and its solution—probably was unique. But they agree that the general pattern of their solution might well apply to other systems. Although the lease-purchase agreement worked well for them, they have no intention of using it when they are able to raise money through conventional financing.

The company began accruing payments, at a stipulated rate monthly, as soon as the contracts were signed. About 25 percent of the purchase price thus was prepaid when the equipment was installed. Thereafter, the balance was paid monthly—at the same rate but with interest added. In each agreement, payments were completed well in advance of the three years in which the total payment was to be made.

Several factors affected the success of the proposals which this system took to the manufacturers. One was the personal relationships between company officials and the suppliers. The president of the power company strongly emphasized this relationship. He pointed out that the manufacturers doubtless would have been unwilling to finance the equipment had they not been convinced that the company's officers were capable and could be depended upon so to manage the property as to make the risk a reasonable one.

Another complication arises from the terms of the mortgage on existing plant. Generally, a lease-purchase agreement of this nature is more easily consummated when the equipment it covers is located in a separate plant. Then it is readily distinguishable from property already covered by the mortgage. When it is possible to install leased equipment in an already-mortgaged plant, it must be placarded carefully and fully, so that it may be distinguished from mortgaged property.

Another factor which the company in question found of great importance is a thorough knowledge of local law. Without it, this president warned, the manufacturer may not be convinced that he can safely permit his equipment to be installed on a lease basis. Obviously, no lessor will install equipment which he may have to reclaim until he is absolutely certain that it will be reclaimable. Not only the terms of an existing mortgage but local law can affect reclaimability.

Then there is a big educational job to be done with the manufacturers. Conditional sales agreements are far from new in the oil-engine field; but they are rare in that part of the electric power business which uses larger and more expensive equipment. Thus, manufacturers must be educated as to their necessity. They must be convinced that they are legal. They must be assured that they will result in profitable business, not bad debts.

Possibilities of this type of equipment financing are better today than they ever have been, it appears. At least two New York banks have expressed considerable interest in discounting the paper a manufacturer holds as a result of such transactions. Should this interest continue, it would make more such transactions possible.

The most troublesome item which faced this power system arose from the terms of a debenture written in 1927—the company's last previous security issue. It forbade the system from obligating itself for greater than one year in advance unless its earnings were double those necessary to meet interest payments and preferred dividends. When the company first sought to lease equipment, its earnings could not meet this stipulation. It realized, of course, that it could not pay for the equipment it needed in one year. Thus, it had to work out a special lease contract which would make the equipment available on a lease basis covering more than one year, but which would not bind the utility for more than one year.

Another pitfall lay in the nature of the lease-purchase agreement. A lease, with an option to buy, which calls for payments that equal the purchase price long has legally been considered a conditional sale. This system wanted to avoid the conditional sale interpretation of its program because it raises problems under the Securities and Holding Company Acts.

With this factor, and the one-year limit on new obligations, in mind, the system set out to find a legal method of achieving what it had to do. The answer was a lease-purchase agreement which did not extend beyond one year and which did not obligate the utility company to renew it every year until the purchase price had been met in full. Nor, because of certain stipulations, could the agreement be construed a conditional sale.

Although such a contract might seem unorthodox, it has proved sound. The mutual interdependence of buyer and seller makes it so.

# HOW

**DESIGN • CONSTRUCT • OPERATE • MAINTAIN**

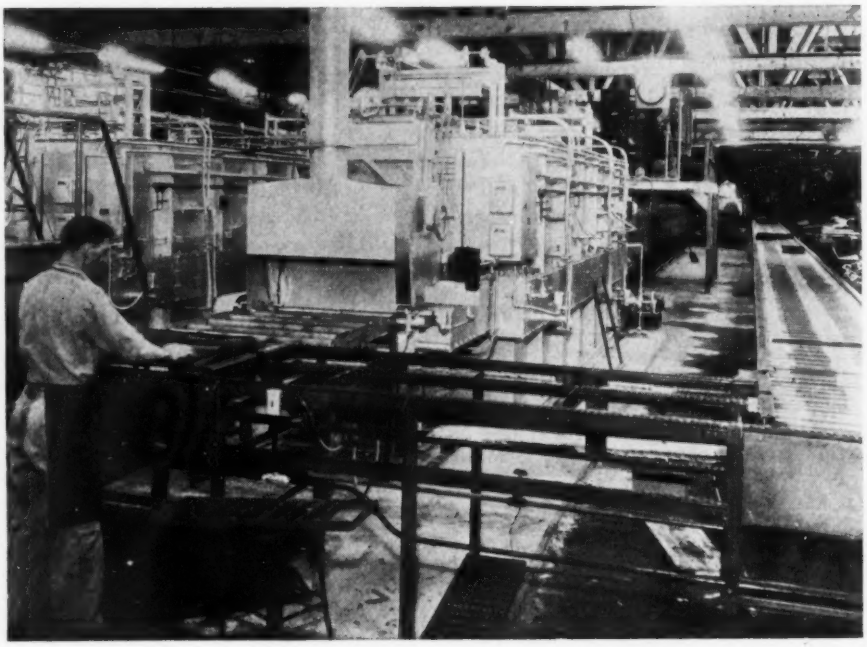
## Furnaces Copper Braze Refrigerator Evaporators

To FURTHER SPEED production at its North Chicago Division, the Houdaille-Hershey Corp installed two new 320-kw roller hearth electric brazing furnaces. These GE furnaces are used in conjunction with three older GE furnaces to copper-braze refrigerator evaporators.

The conversion of stamped, sheet-steel plates into brazed sections is handled at each furnace by one operator. The furnace door is 35 in. wide and opens vertically 13 in. The heating chamber, extending 17 ft, brazes the pieces together at a temperature of 2,050 F.

From the furnace chamber the rollers convey the brazed parts through a 70-ft cooling chamber. The discharge door of this chamber opens automatically, permitting the parts to be rolled out on a conveyor system that has been installed for use with the furnaces.

The racks leave the cooling chamber and are guided by the furnace rollers to an endless chain conveyor.



**CHARGING END** of copper-brazing electric furnaces. Cooling chamber is at far end and rack return conveyor is at right

They are carried back to the charge end of the furnace, where the conveyor again becomes an endless chain. At this point the racks are unloaded by the furnace operator. After being brazed, the parts are carried on fork trucks to be baked, chemically treated, soldered, and formed.

• • •

## Use of Damper Winding on A-C Generators

### VIII*—POWER PULSATION


**WILLIAM L. RINGLAND**
Electrical Engineer
Allis-Chalmers Mfg Co
Milwaukee, Wis.


DAMPER WINDINGS can be safely relied upon to limit power pulsation only for the special circumstances which consist, in their simplest form, of the natural frequencies of two units being very nearly the same and nearly coinciding with the impressed frequency from a third unit. Other impressed and natural frequencies are assumed to be sufficiently removed to require no consideration. It might be expected that a very large damping torque would be required to prevent a violent oscillation of the two units against each other if the impressed frequency happened to be between the natural frequency of the two units. However, parallel operation without excessive power pulsation is possible under these circumstances if at least one of the two generators has a suitable damper winding.

The basis for this phenomenon is the fact that at resonance the mechanical oscillation of a generator from its average rotational position is 90 deg out of phase with the impressed force. At lower impressed frequencies this phase displacement approaches zero, while at higher impressed frequencies it approaches 180 deg. Power pulsation between two generators can take place only to the extent that they are oscillating 180 deg out of phase, or against each other, in other words. If both are exactly in resonance with the impressed force, their phase angles with respect to the force must be 90 deg for both. They cannot then oscillate against each other, but must swing together, acting as a single gen-

* Concludes the series which began in ELECTRICAL WORLD, August 16, 1947, page 81.

erator with no power pulsation between them. In practice, exact resonance cannot be maintained because of changes in load and excitation, and some phase displacement and power pulsation is to be expected. Damping permits a greater difference in the individual natural frequencies of the two units for the same phase displacement and power pulsation, resulting in successful parallel operation over a wider range of load conditions.

In view of the comparative rarity of instances where damper windings are of significant value from the standpoint of power pulsation, their presence on practically all diesel-engine-driven generators is somewhat difficult to understand. The present practice in this respect appears to be in need of a careful re-examination.

• • •

# Measuring Voltage Dip of Resistance Welding

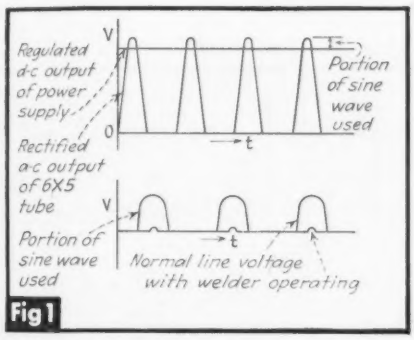


Fig 1

**METHOD** of obtaining portion of voltage sine wave

**F. W. BUCK**
Engineering Dept
The United Illuminating Co
New Haven, Conn.

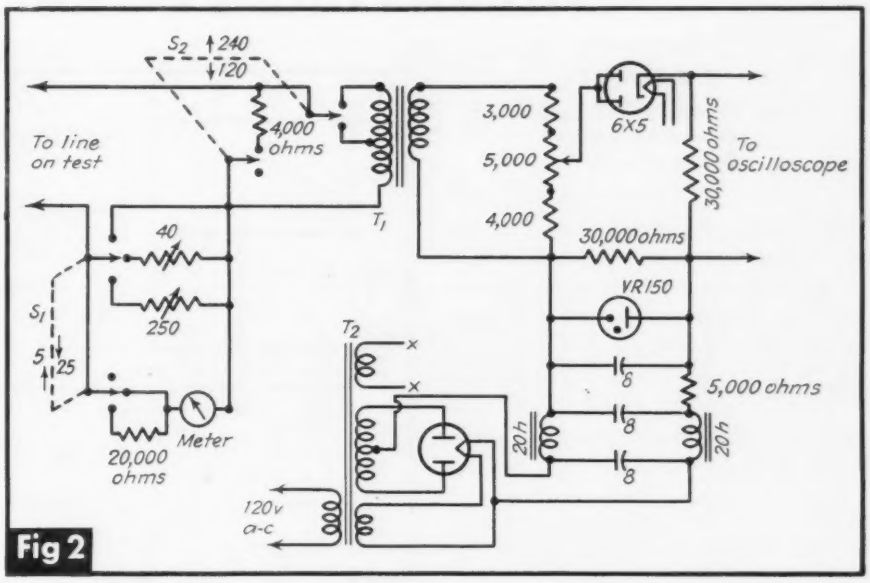


Fig 2

**VOLTAGE DROP METER CIRCUIT**—Switch $S_1$ provides for three positions: (a) A straight-through connection for observing the line voltage condition; (b) a 5-v drop; (c) a 25-v drop. Care has to be taken that the top section of $S_1$ is always in contact with one of the three terminals and not open between positions; otherwise full line voltage may be applied to the meter. Transformer $T_1$ has a 120/240-v primary with almost any secondary rating from 125 v upward, with a current rating above 20 milliamperes. The one available had a 30-ma, 476-v center-tapped secondary, half of which was used. The 4,000-, 5,000- and 3,000-ohm. bleeder was designed to draw 25 to 30 ma with the variable section chosen to make a voltage peak appear on the scope screen with the primary voltage between 120 and 90 or 240 and 210. This variable section is the resistor labeled "Range" on the instrument panel of the electronic voltage-drop meter

To MEASURE VALUES of the short-duration dips occasioned by resistance welding, The United Illuminating Co system uses a voltage-drop meter and an oscilloscope.

A crest fraction of the tested circuit voltage is impressed on the oscilloscope screen, and balanced against a voltage drop equivalent to that caused by the welder. (Fig 1) The alternating current is rectified in a half-wave circuit; resulting half cycles are added algebraically (series circuit) to a relatively constant d-c voltage, leaving a few volts at the top of the half wave as a remainder. This is applied to the vertical deflection plates of the oscilloscope. Adjustments are made so that the portion appearing on the scope screen with the welder operating includes only the top of the sine wave. By adjustment (1) of the meter controls; (2) of the scope "zero line" well below the tube face; and (3) of the scope amplifier gain, extreme accuracy can be obtained, well within the limits of the Weston 1,000-ohms-per-volt, rectifier-type meter.

The operating procedure is to apply the tested line voltage (Fig 2) with $S_1$ in the test position. The range rheostat is then adjusted to the lowest position that will indicate a tip of the sine wave on the scope during the weld. The scope trace is then adjusted to the maximum position downward.

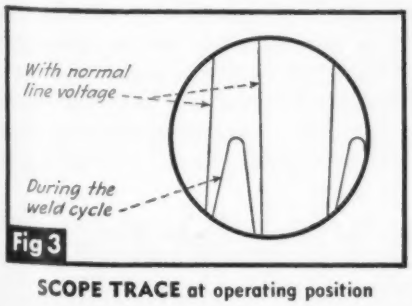


Fig 3

**SCOPE TRACE** at operating position

Fig 4

**INSTRUMENT CHASSIS** is 6 in. x 10 in. x 2 in., and the panel 6½ in. x 10 in. of ¼-in. Lamicoid. Outside dimensions are 10 in. x 11 in. x 10 in. to provide for cord storage space

(Fig 3) Scope gain is increased to indicate the top of the sine wave on the screen during the weld. Its position is noted. $S_1$ is changed to either the 5- or 25-v range, whichever applies, and the proper 40- or 250-ohm rheostat adjusted to position the trace as it was above during the weld. The meter then indicates directly the voltage drop occasioned by the welder.

The d-c supply is conventional. Transformer $T_2$ provides about 500 v when center-tapped with a 6.3-v winding for the 6x5. The rectifier is an 80 or similar. The VR 150 regulator tube maintains reasonably constant voltage in the indicating circuit. The 4,000-ohm resistor in the line circuit is of 25-w capacity and the variable resistors are 5-w, wire-wound. All other resistors are 10-w, wire-wound, and the meter multiplier is a 20,000-ohm precision resistor. The number of controls could be reduced if a dual control were made up for the voltage drop variable resistors. The instrument panel is shown in Fig 4.

• • •

# Paralleled Circuits and Ratios of R/X

**P. E. BENNER**
Central Station Engineering Divisions
General Electric Co
Schenectady, N. Y.

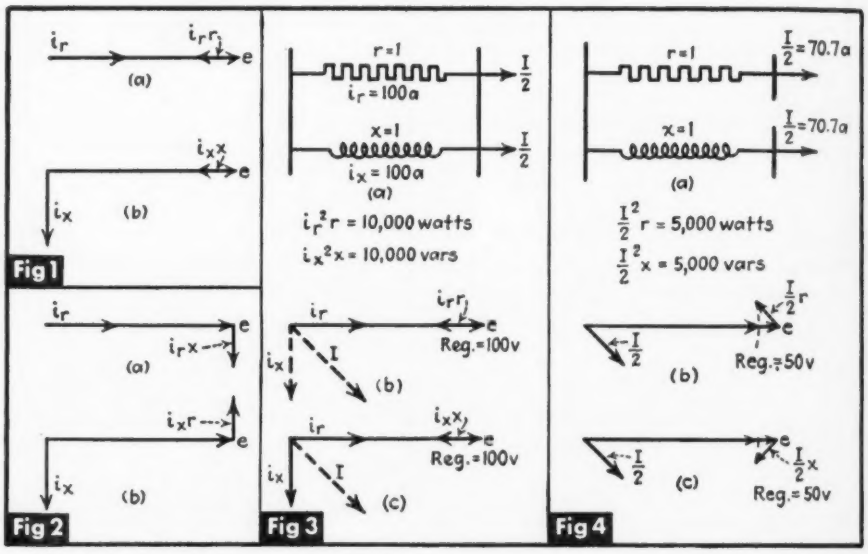
A HIGH-VOLTAGE open-wire circuit is often operated in parallel with a low-voltage cable system. Better results (lower losses and improved regulation) would result if each were to be arranged to carry its share of the load without paralleling. The pronounced difference in ratio of reactance and resistance of the two paths leads to voltage differentials which circulate out-of-phase components. These increase the losses and make regulation poorer when they are paralleled.

The conditions can be explained by simple vector diagrams. In Fig 1a, voltage drop $I_r r$, due to the in-phase component of current in the resistance circuit, is directly opposed to the voltage $e$. The voltage drop $I_x x$, Fig 1b, is also directly opposed to $e$ so that if $r$ equals $x$ and $I_r$ equals $I_x$, the voltage drops are equal and in phase.

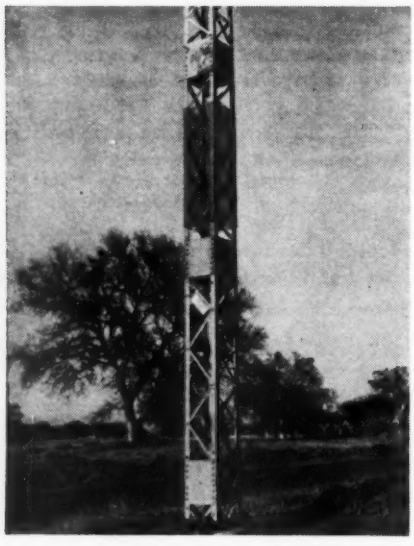
On the other hand if, as in Fig 2, $I_r$ was caused to flow through the reactance and $I_x$ through the resistance, the voltage drops in their respective circuits would be 180 deg out of phase, and if the circuits were paralleled there would be a vector difference in the voltages. However, since the voltage of each circuit must be equal in phase and magnitude to the voltage in the other circuit at both receiving and sending ends, there can be no vector difference in voltage in paralleled circuits. Therefore, when a current $I$, Fig 3b and c, flows through two parallel circuits, the one resistance and the other reactance, it divides into in-phase ($I_r$) and out of phase ($I_x$) components which distribute as shown in Fig 3a so that the in-phase component flows through the resistance circuit and the out of phase component through the reactance circuit.

Assuming a current of 141.4 amp, 0.707 pf, the $I_x$ would equal 100 amp and $I_r$ 100 amp, and the losses would be 10,000 w and 10,000 vars if $r$ equals 1 ohm and $x$ equals 1 ohm respectively. The voltage drop would be 100 v. If instead of paralleling the two circuits each one is arranged (Fig 4) to serve one-half of the load, then the losses would be 5,000 w and 5,000 vars respectively, and the effective voltage drop in each circuit would be 50 v.

In other words, by not paralleling the two circuits, the losses and voltage drop are reduced by one-half.




**VECTOR DIAGRAMS** show voltage drops for (1) in-phase and (2) out-of-phase components in resistance and reactance parallel circuits; also losses in parallel and radial circuits



**SCREEN PREVENTS CLIMBING.** Anti-climbing wire guards as shown are used on square latticed steel poles by Pacific Gas and Electric Co. Over a period of years it has been found that these wire screens effectively prevent boys from the dangerous practice of climbing the poles.

# fluorescent ballasts

All the power for a fluorescent lamp goes through the ballast. If the lamp is to deliver its full rated life and full light output, the ballast must be not "just a transformer," but an accurately made piece of equipment, with permanent electrical characteristics tailored to the voltage and current requirements of the lamp under both starting and running conditions.

General Electric, maker of lamps, ballasts, starters, cable and lampholders, is well aware of this interdependence. General Electric ballasts are designed, built, *and tested* for permanent, matched characteristics.

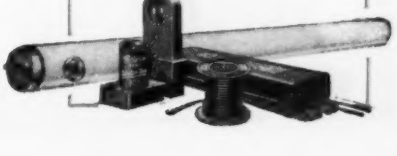
# Matched for the job!

The operating characteristics of General Electric ballasts are uniform, permanent, and accurately matched to those of standard fluorescent lamps.

This—plus the reliability and quietness of these ballasts—can go a long way in making friends for your fluorescent fixtures.

*Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

**BALLASTS**
**CABLE**
**LAMPS**
**STARTERS**
**LAMPHOLDERS**
*for*
***DEPENDABILITY***
*in fluorescent lighting*



**GENERAL ELECTRIC**

412-10

# Performance Standards For Polyphase Squirrel-Cage Motors

**Performance data have been established for constant-speed, continuous-rated, squirrel-cage induction motors designed to withstand full-voltage starting. Values are at rated voltage and frequency. The data given here are an adaptation from National Electrical Manufacturers Association's motor performance standards effective Jan 1, 1948**

Integral polyphase induction motors are now classified by Design A, B, C, D and F. Each of the five designs offers a different combination of current, speed and torque characteristics. The torques represent the upper limits of the range of application for these motors.

**Locked-Rotor Current.** Values in Table I are for 3-phase, 60-cycle motors.

**Locked-Rotor Torque.** Values are for 60- and 50-cycle motors and are expressed in percent of full-load torque.

Torques of Design A and B motors are listed in Table II, and of Design C motors in Table III.

Torques of Design D motors, 4-, 6- and 8-pole, shall be 275 percent.

Torques of Design F motors, 4- and 6-pole, shall be 125 percent.

**Breakdown Torque.** Values in Table IV are for Design A, B, C and F, 60- and 50-cycle motors, are expressed in percent of full-load torque. No values are given for Design D.

**Slip.** Values are at rated motor load. Designs A, B, C and F motors have slip less than 5 percent; however, Design A and B motors with ten or more poles may have slip slightly greater than 5 percent.

Design D motors have slip 5 percent or more at rated load conditions.

TABLE I—Locked-Rotor Currents Of 220-V* Motors

(3-phase, 60-cycle)

| Hp | Amperes: Design B, C & D | Amperes: Design F |
|---|---|---|
| 1† | 24† | ... |
| 1½ | 35 | ... |
| 2 | 45 | ... |
| 3 | 60 | ... |
| 5 | 90 | ... |
| 7½ | 120 | ... |
| 10 | 150 | ... |
| 15 | 220 | ... |
| 20 | 240 | ... |
| 25 | 365 | ... |
| 30 | 435 | 270 |
| 40 | 580 | 360 |
| 50 | 725 | 450 |
| 60 | 870 | 540 |
| 75 | 1,085 | 675 |
| 100 | 1,450 | 900 |
| 125 | 1,815 | 1,125 |
| 150 | 2,170 | 1,350 |
| 200 | 2,900 | 1,800 |

*Locked-rotor current at other voltages shall be inversely proportional to the voltage.

†For integral horsepower motors rated 1 hp and smaller the locked rotor current is 24 amp per hp.

TABLE III—Locked-Rotor Torques Of Design C Motors

(Percent F. L. Torque)

| Hp | Synchronous Speeds, 60 and 50 Cycles: 1,800 1,500 | 1,200 1,000 | 900 750 |
|---|---|---|---|
| ½—2 | ... | ... | ... |
| 3 | ... | 250 | 225 |
| 5 | 250 | 250 | 225 |
| 7½ | 250 | 225 | 200 |
| 10 | 250 | 225 | 200 |
| 15 | 225 | 200 | 200 |
| 20 | 200 | 200 | 200 |
| 25 and larger | 200 | 200 | 200 |

TABLE II—Locked-Rotor Torques of Design A and B Motors

(Percent F. L. Torque)

| Hp | Synchronous Speeds, 60 and 50 Cycles: 3,600 3,000 | 1,800 1,500 | 1,200 1,000 | 900 750 | 720 600 | 600 500 | 514 428 | 450 375 |
|---|---|---|---|---|---|---|---|---|
| ½ | ... | ... | ... | 150 | 150 | 115 | 110 | 105 |
| ¾ | ... | ... | 175 | 150 | 150 | 115 | 110 | 105 |
| 1 | ... | 275 | 175 | 150 | 150 | 115 | 110 | 105 |
| 1½ | 175 | 265 | 175 | 150 | 150 | 115 | 110 | 105 |
| 2 | 175 | 250 | 175 | 150 | 145 | 115 | 110 | 105 |
| 3 | 175 | 250 | 175 | 150 | 135 | 115 | 110 | 105 |
| 5 | 150 | 185 | 160 | 130 | 130 | 115 | 110 | 105 |
| 7½ | 150 | 175 | 150 | 125 | 120 | 115 | 110 | 105 |
| 10 | 150 | 175 | 150 | 125 | 120 | 115 | 110 | 105 |
| 15 | 150 | 165 | 140 | 125 | 120 | 115 | 110 | 105 |
| 20 | 150 | 150 | 135 | 125 | 120 | 115 | 110 | 105 |
| 25 | 150 | 150 | 135 | 125 | 120 | 115 | 110 | 105 |
| 30 | 150 | 150 | 135 | 125 | 120 | 115 | 110 | 105 |
| 40 | 135 | 150 | 135 | 125 | 120 | 115 | 110 | 105 |
| 50 | 125 | 150 | 135 | 125 | 120 | 115 | 110 | 105 |
| 60 | 125 | 150 | 135 | 125 | 120 | 115 | 110 | 105 |
| 75 | 110 | 150 | 135 | 125 | 120 | 115 | 110 | 105 |
| 100 | 110 | 125 | 125 | 125 | 120 | 115 | 110 | 105 |
| 125 | 100 | 110 | 125 | 125 | 120 | 115 | 110 | 105 |
| 150 | 100 | 110 | 125 | 125 | 120 | 115 | 110 | 105 |
| 200 | 100 | 100 | 125 | 125 | 120 | 115 | 110 | 105 |

TABLE IV—Breakdown Torques Of Design A,[a] B, C and F Motors

(Percent F. L. Torque)

| Hp and Syn. rpm (60–50 cy) | Design B |
|---|---|
| ½—900 – 750 | 250 |
| Lower than 750 | 200 |
| ¾—1200 – 1000 | 275 |
| 900 – 750 | 250 |
| Lower than 750 | 200 |
| 1 —1800 – 1500 | 300 |
| 1200 – 1000 | 275 |
| 900 – 750 | 250 |
| Lower than 750 | 200 |
| 1½—3600 – 3000 | 300 |
| 1800 – 1500 | 300 |
| 1200 – 1000 | 275 |
| 900 – 750 | 250 |
| Lower than 750 | 200 |
| 2 —3600 – 3000 | 275 |
| 1800 – 1500 | 275 |
| 1200 – 1000 | 250 |
| 900 – 750 | 225 |
| Lower than 750 | 200 |
| 3 —3600 – 3000 | 250 |
| 1800 – 1500 | 275 |
| 1200 – 1000 | 250[b] |
| 900 – 750 | 225[b] |
| Lower than 750 | 200 |
| 5 —3600 – 3000 | 225 |
| 1800 – 1500 | 225[b] |
| 1200 – 1000 | 225[b] |
| 900 – 750 | 225[b] |
| Lower than 750 | 200 |
| 7½—3600 – 3000 | 215 |
| 1800 – 1500 | 215[b] |
| 1200 – 1000 | 215[b] |
| 900 – 750 | 215[b] |
| Lower than 750 | 200 |
| 10 —3600 – 3000 | 200 |
| 1800 – 1500 | 200[c] |
| 1200 – 1000 | 200[c] |
| 900 – 750 | 200[c] |
| Lower than 750 | 200 |
| 15 to 25 hp, all speeds | 200[c] |
| 30 hp and larger, all speeds | 200[c/f] |

(a) Design A breakdown torques are in excess of values shown for Design B.
(b) Design C values are 25 points less.
(c) Design C values are 10 points less.
(f) Design F value is 65 points less.

# AND SHIELDING
# IMPULSE STRENGTH TO NEW HIGH

● All G-E Spirakore distribution transformers, rated 22,000 volts and above, have progressive-layer insulation and shielding.

*There are now more than 2700 high-voltage Spirakore distribution transformers in service which have shielded windings and progressive-layer insulation. Some have seen* more than *five lightning seasons. Their operating record to date is practically perfect.*

## PROGRESSIVE-LAYER INSULATION

In developing progressive-layer insulation, General Electric has adapted a basic mechanical principle to electrical design. It is the principle of applying the greatest strength where greatest stresses exist. By a unique method of construction, General Electric has greatly increased the impulse strength of transformer insulation.

### How it is done

In a multi-layer coil, the voltage stress—normal and impulse—between layers ranges from that between adjacent turns at one end of the layer to many times this stress at the other.

With progressive layer insulation, this difference in stresses is compensated for by winding into the coil, along with the conductor, a full-width layer of thin, tough paper of high dielectric strength. As turns are added, the paper layers increase in number. In this way, the insulation strength between any two conductors is kept proportional to the voltage stress, regardless of the position of the conductors in the winding—an important contribution to the superior impulse strength of G-E high-voltage transformers.

## SHIELDING

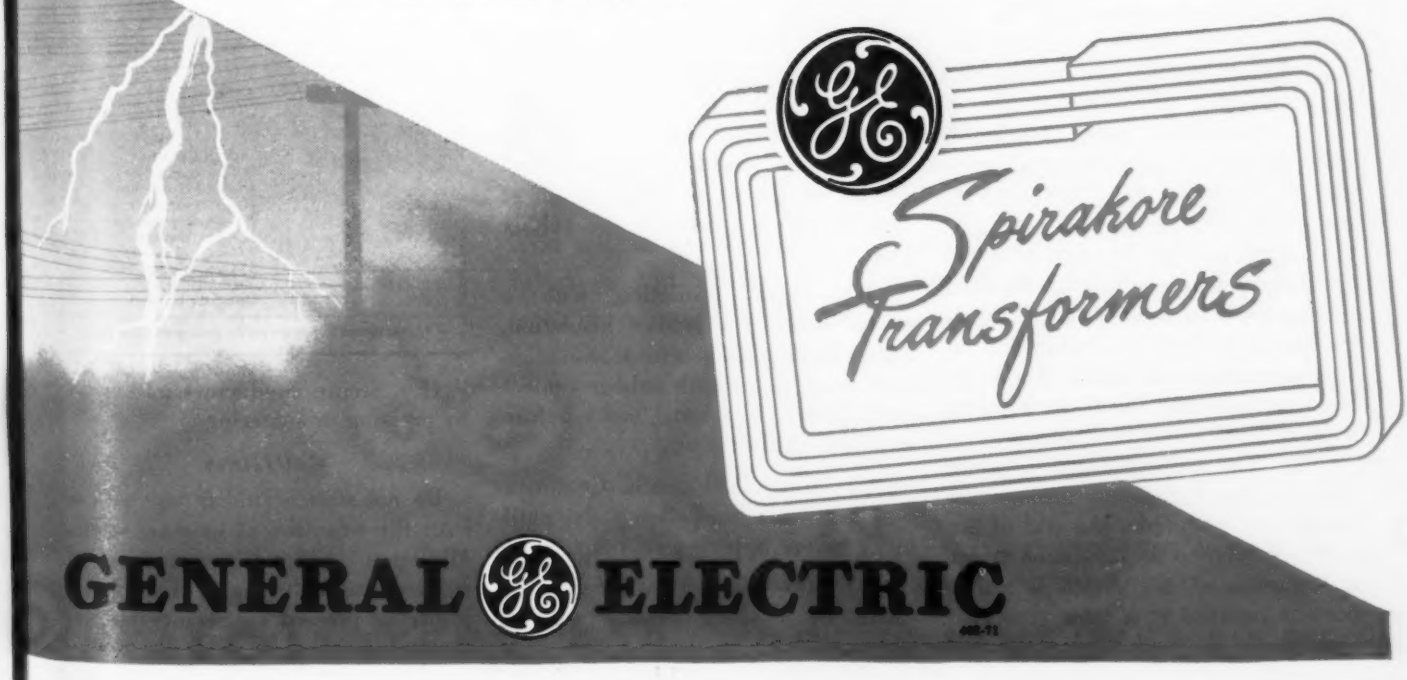
Electrostatic shielding, a development of General Electric, was introduced first in the power-transformer field in 1926. Since then, thousands of shielded-winding power transformers, totaling more than 25,000,000 kva have been built. Their service records have clearly demonstrated the value of shielding as the best means of preventing harmful concentrations of voltage caused by transient voltage surges.

### How it works

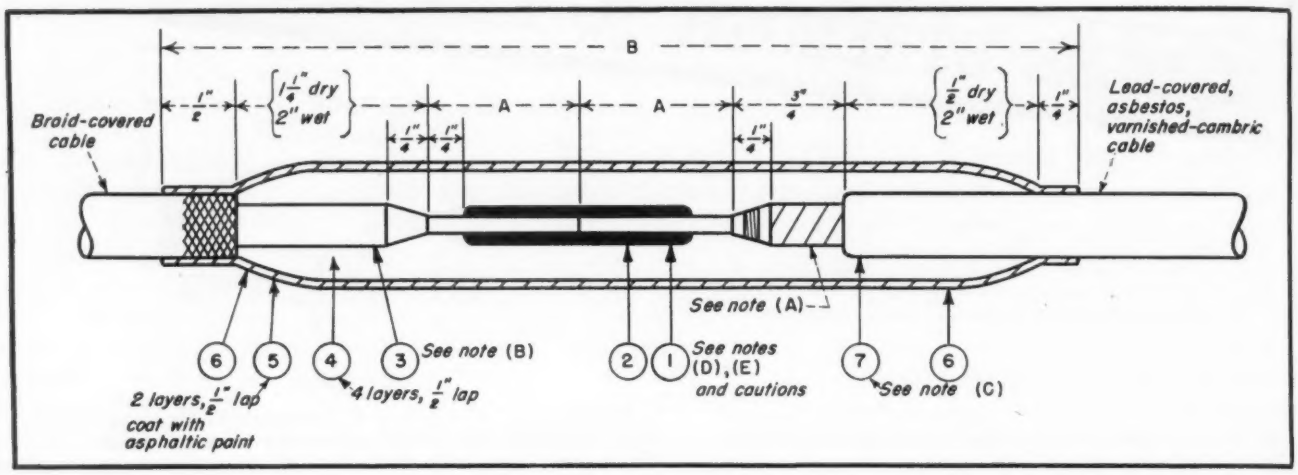
Electrostatic shielding is the electrical equivalent of protecting a brittle mechanical structure by encasing it in a steel shell. The force of a shock or sudden blow, which would be destructive if concentrated at one point, is distributed over a large area so that stresses can be absorbed without damage.

In General Electric high-voltage distribution transformers, an insulated metal shield is placed around the windings and is electrically connected to the line end of the winding. The surge voltage allowed by the lightning arrester, which might otherwise produce tens of thousands of volts between adjacent layers or turns, is so distributed by the shield as to prevent harmful concentrations of voltage stresses.

**ASK FOR THIS BULLETIN** *General Electric's new bulletin, GEA-4521, on shielded windings and progressive-layer insulation, is now being distributed. If you have not received a copy, write Apparatus Department, General Electric Company, Schenectady 5, N. Y.*



# How To Joint Braided Cable To Lead-Covered, 600-V Cable




**A procedure for jointing single-conductor control cables—one with rubber insulation, braid covered, and other with asbestos, varnished-cambric insulations, lead covered—used in generating stations and substations; an adaptation from standardized instructions of the Philadelphia Electric Co**

**Table of Dimensions**

| Conductor Size, AWG or Mcm | Condition | Dimension A, inches | | Dimension B, inches | |
|---|---|---|---|---|---|
| | | Soldered | Pressed | Soldered | Pressed |
| 10 to 6 | Dry | 1 | —— | 6 3/4 | —— |
| | Wet | 1 | —— | 9 | —— |
| 2 to 1/0 | Dry | 1 1/4 | 15/16 | 7 1/4 | 7 1/16 |
| | Wet | 1 1/4 | 15/16 | 9 1/2 | 9 5/16 |
| 2/0 | Dry | 1 1/4 | 1 | 7 1/4 | 7 3/16 |
| | Wet | 1 1/4 | 1 | 9 1/2 | 9 7/16 |
| 4/0 | Dry | 1 1/2 | 1 | 7 3/4 | 7 5/16 |
| | Wet | 1 1/2 | 1 | 10 | 9 9/16 |
| 350 | Dry | 1 1/2 | 2 1/16 | 7 3/4 | 9 3/8 |
| | Wet | 1 1/2 | 2 1/16 | 10 | 11 5/8 |
| 500 | Dry | 1 3/4 | 2 5/16 | 8 1/4 | 9 7/8 |
| | Wet | 1 3/4 | 2 5/16 | 10 1/2 | 12 1/8 |

## Construction Notes

(A) Removing the Lead Sheath:

1. The tools required are a sturdy knife, a light hammer, and a pair of pliers. (The usual chipping knife and hammer used by the T&D underground lines section are satisfactory, but they may be too awkward and heavy for use on the smaller cables in limited space.)

2. Make a circumferential score one-half way through the sheath at a distance from the end of the cable of A plus $\frac{3}{4}$ in. The score is made by holding the knife blade perpendicular to the axis of the cable and tapping lightly on the back with the hammer as the knife is moved around the circumference. The knife must not penetrate through the sheath and damage the insulation.

3. Score the cable longitudinally from the circumferential score to the end of the cable. The point of the knife is used and the blade is held at tangent to the insulation. If the point penetrates through the lead in this position it will pass between the sheath and the insulation and no serious damage will result. The knife is forced into the sheath by tapping it on the back with the hammer.

4. The longitudinal score should be cut completely through the sheath for $\frac{1}{2}$ in. from the end of the cable. Damage to the insulation under this portion of the sheath is unimportant because it is later removed. One edge of the score is pried up with the knife and grasped with the pliers, and the sheath is torn off with a twisting motion. This will leave the end of the sheath slightly belled. Round off the edge of the sheath so that it will not damage the rubber tape.

(B) Taper insulation with a sharp knife. On rubber insulation, finish taper and roughen insulation with rasp. Coat with rubber cement and allow to dry until tacky before applying rubber tape.

(C) Clean lead sheath. Coat with bonding cement and allow to dry until tacky before applying rubber tape.

(D) Do not scrape conductor. Clean by rubbing briskly with a coarse cloth.

**Bill of Material**

| Item | Description |
|---|---|
| 1 | Pigtail joint[a]<br>Solder connector[a]<br>Pressed connector[a] |
| 2 | Rosin core solder[b]<br>Stearic core solder[b] |
| 3 | Rubber cement |
| 4 | 3/4-in. rubber tape |
| 5 | 3/4-in. friction tape |
| 6 | Asphaltic paint |
| 7 | Bonding cement |

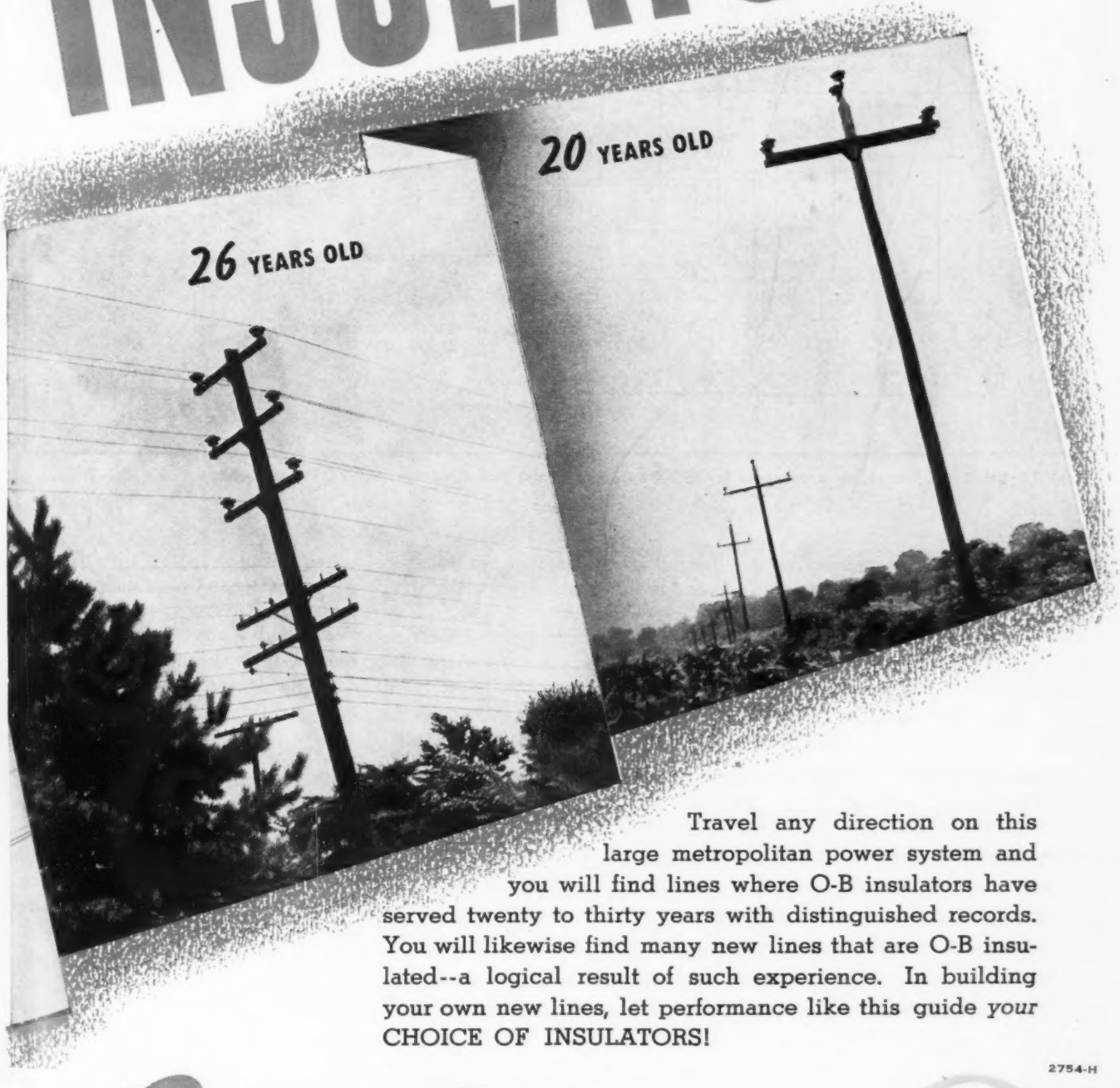
[a], [b] Alternates for respective indicated items.

(E) Secure conductors into sleeve by pressing or soldering.

### *CAUTIONS*

Do not stretch rubber tape to less than three-fourths of original width. Minimum working temperature of rubber tape is 40 deg F. Use pigtail joints or pressed connectors in current transformer circuits.

# THIS GUIDE INSULATORS




Travel any direction on this large metropolitan power system and you will find lines where O-B insulators have served twenty to thirty years with distinguished records. You will likewise find many new lines that are O-B insulated--a logical result of such experience. In building your own new lines, let performance like this guide *your* CHOICE OF INSULATORS!

2754-H

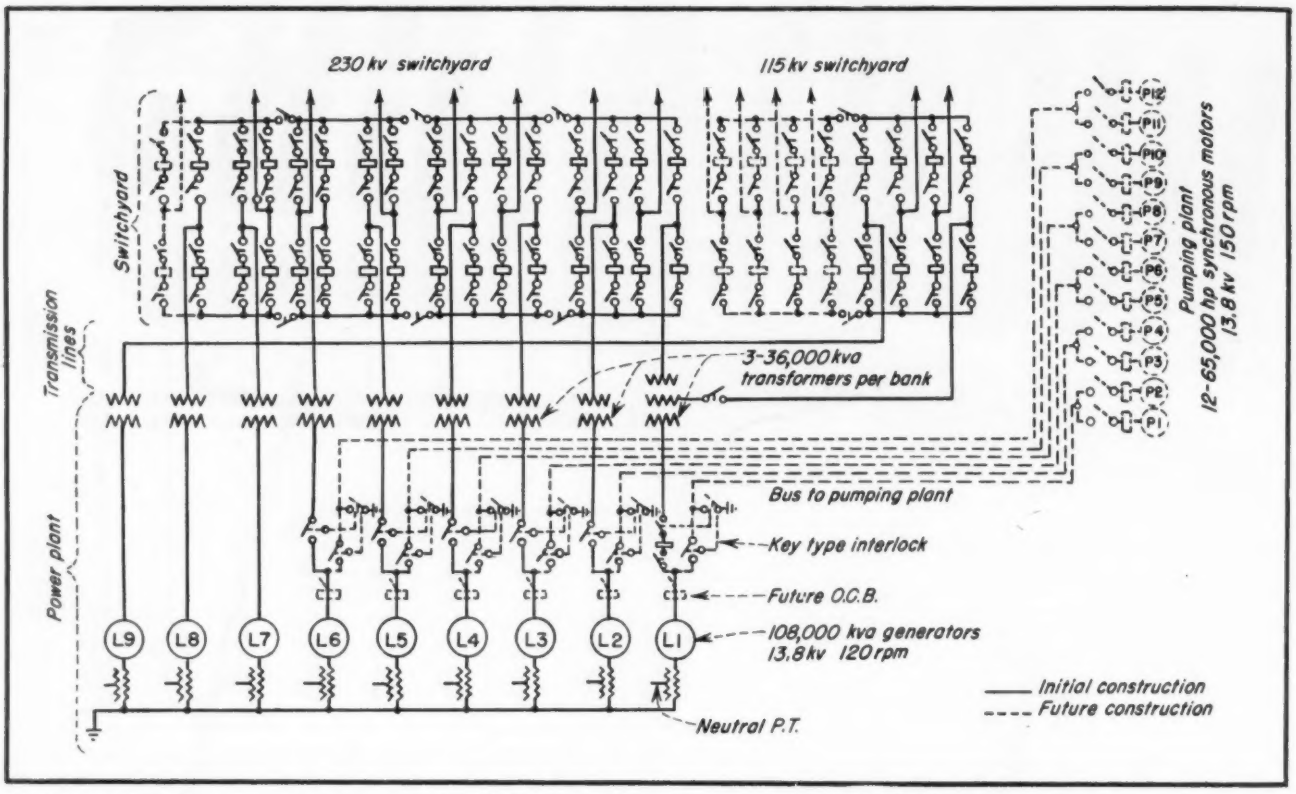
Ohio Brass

MANSFIELD, OHIO

Canadian Ohio Brass Company, Limited
Niagara Falls, - - - Ontario

**HEADQUARTERS FOR PORCELAIN INSULATION**

# Provisions for Starting 65,000-Hp Synchronous Motors




**SINGLE LINE** of power supply arrangement for 65,000-hp Grand Coulee pumps fed from 108,000-kw generators

BECAUSE OF their unprecedented size and capacity, the motors and pumps to be installed in Grand Coulee required careful design and operating procedures. These six 65,000-hp, synchronous-driving motors and vertical-shaft, centrifugal pumps will lift irrigation water for the Columbia Basin Project when they are installed.

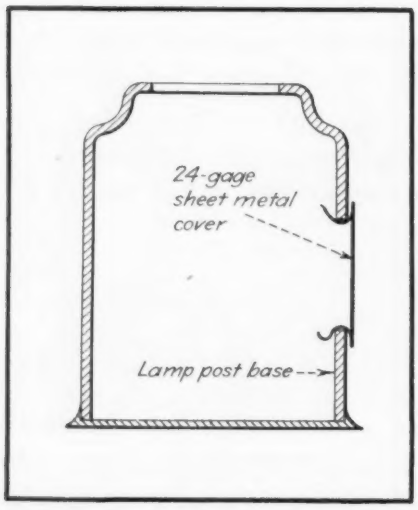
Increased power production for driving the pumps will be provided by installation of six main generating units. These will be essentially the same as six now in operation, rated 108,000 kva each at 120 rpm. As shown in the accompanying diagram, power will be supplied directly from one generator to two of the pump motors without going to the station bus. Provision is made for operating either motor singly should the generator output be decreased by a low available head.

Two plans of operation are proposed for bringing these huge machines up to full speed: First, by starting both generator and motor from rest; and second, by operating the generator at reduced speed and starting the motor as an induction motor with subsequent automatic field application to pull the motor into synchronism.

Under the first plan, the turbine gates are opened under manual control, generator field rheostat shorted, and a starting resistor inserted. At the same time, the motor oil circuit breaker is closed and field applied to the motor. Both units start and are accelerated in synchronism. During this time, necessary adjustments are made with taps on the starting resistor. This is replaced by the normal resistor when full speed is reached.

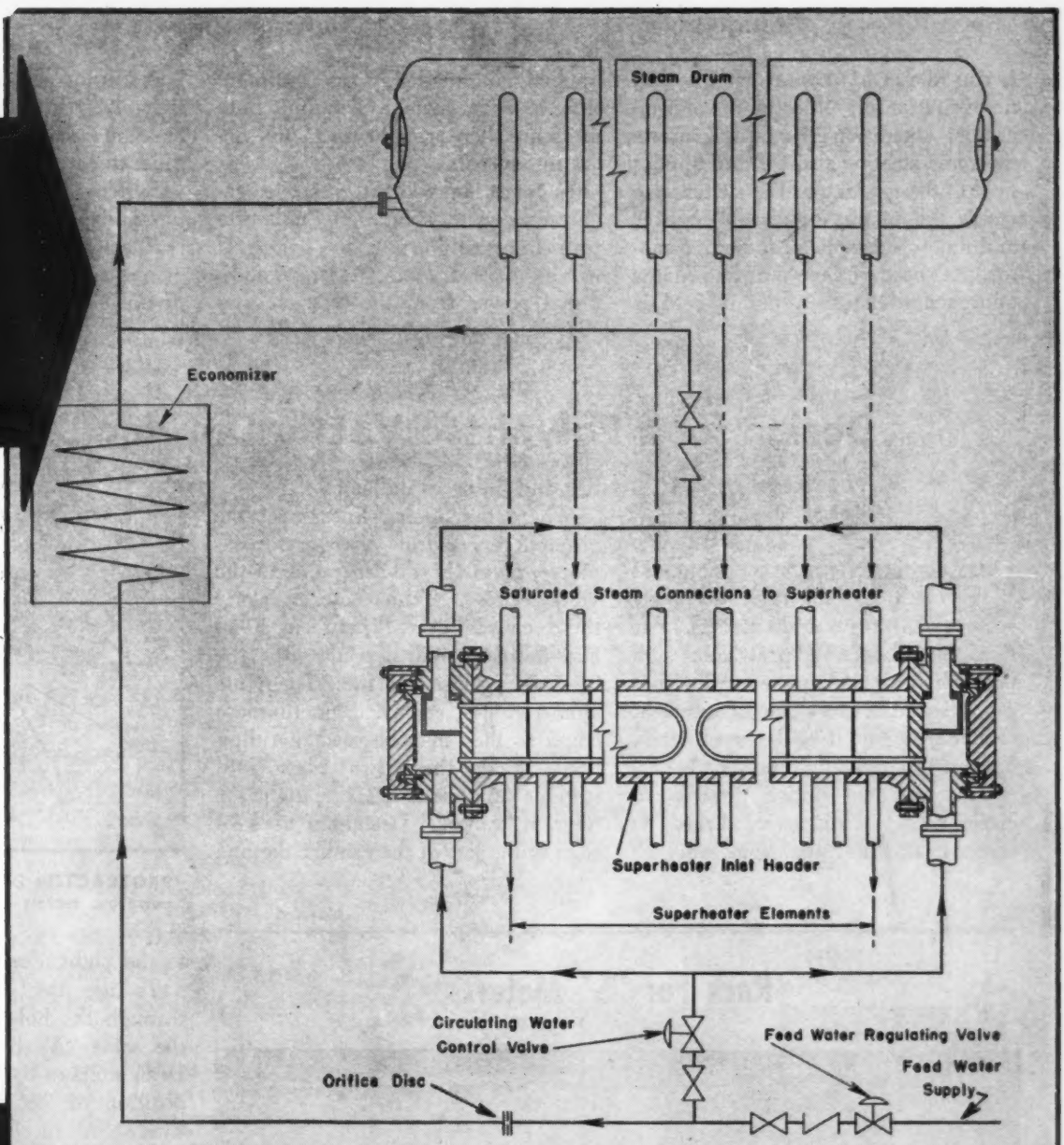
Under the alternate plan, generator

# Sheet Metal Covers for Lamp Post Openings

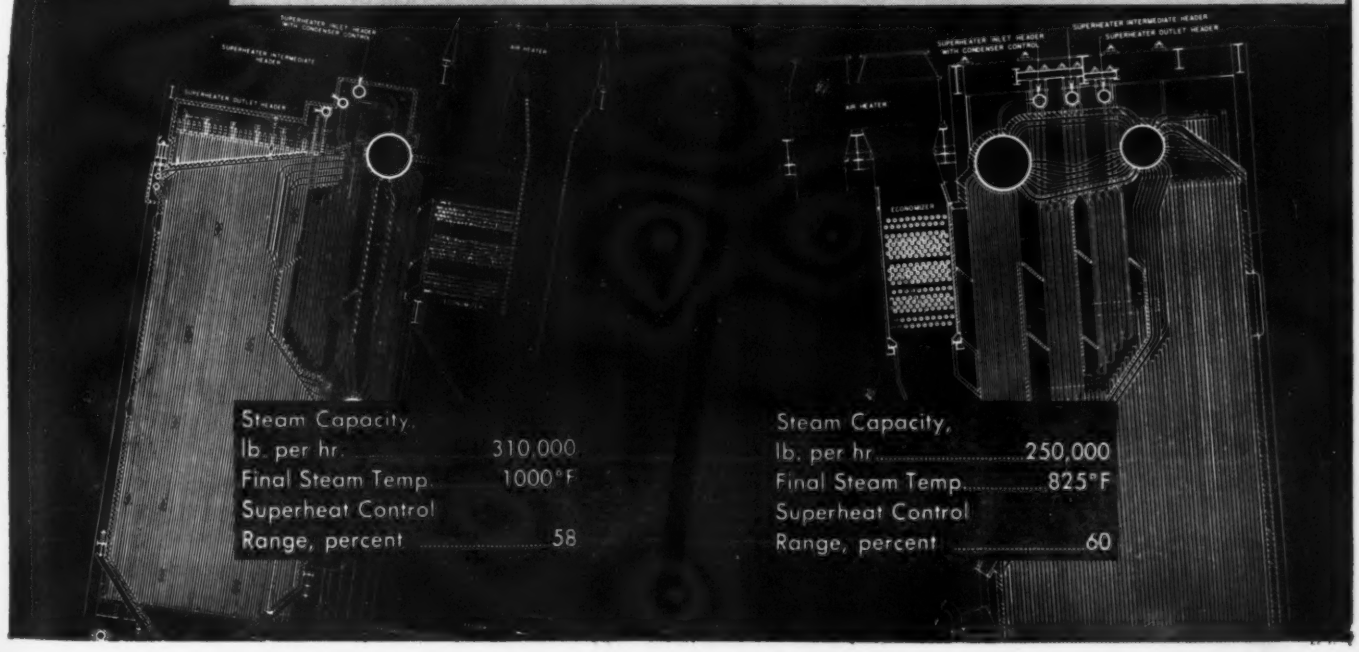



**M. L. MONSON**
Fosston Municipal Light & Power
Fosston, Minn.

IT IS OFTEN DIFFICULT to replace broken or lost covers on lamp-post bases. The sheet metal cover illustrated can be made quite easily. The upper part of the cover is made with a cup-shaped extension. This slips up on the base; the lower part, with an S-shaped projection, springs over the bottom edge. The cover is then snapped into place. It is easily removed by prying with a screw driver. It was necessary to use this method of closure to prevent accidents and tampering that would otherwise happen.




This enlarged section through the superheater inlet header shows the arrangement of condenser-type control of final steam temperature.



| | |
|---|---|
| Steam Capacity, lb. per hr. | 310,000 |
| Final Steam Temp. | 1000°F |
| Superheat Control Range, percent | 58 |

| | |
|---|---|
| Steam Capacity, lb. per hr. | 250,000 |
| Final Steam Temp. | 825°F |
| Superheat Control Range, percent | 60 |

is run idle at 65 percent rated speed, no excitation on either motor or generator. Operation of a switch inserts the same starting resistor and applies field to the generator. The switch also closes the motor oil circuit breaker and motor starts as an induction motor. As speed of generator and motor approach each other, motor field is applied automatically at optimum time to effect synchronization. Both units are then brought up to full operating speed.

In operation, generator can be synchronized with station bus either to furnish excess power to the bus or, if driving both motors, to draw additional power from the 60-cycle system. Motor can be stopped by opening oil circuit breaker after making necessary adjustments on turbine and generator to prevent overspeeding.

System as outlined affords good flexibility. Ultimate installation of twelve pumps will achieve a simplicity of operation remarkable for a project of this size.

• • •

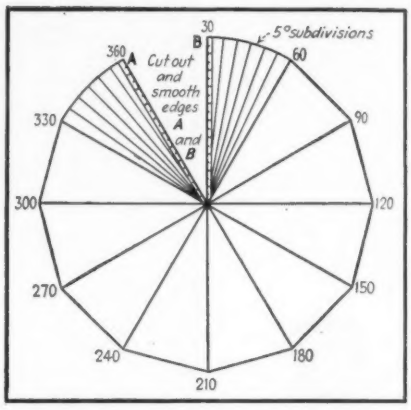
# Design for a Polyphase Vector Drawing Device

**A. F. STILSON**
Galesburg, Ill.

IN POLYPHASE METERING PROBLEMS it is often desirable to draw quickly vectors of voltages and currents. For this the illustrated protractor will prove handy. It can be made from 4 or 5 sq in. of glossy medium-weight cardboard; but if to be used often, light metal or celluloid may be better.

To make the device, inscribe a circle 4 in. in diameter. From its center draw thin radial lines every 30 deg and 5 deg as indicated.

Where the 30-deg lines meet the circumference, draw chords; for example, from the 60-deg point to the 90-deg point. Trim material along these chords except between 30-60 and 330-360 points. Cut along the 0—360 deg line and the 30-deg line almost to the center. Smooth these edges so they may be used in ruling lines. Scale these two edges into suitable subdivisions, 10ths, 20ths, or finer if wanted. Designate as "A" edge to the left of the center; the one to the right, designate as edge "B."



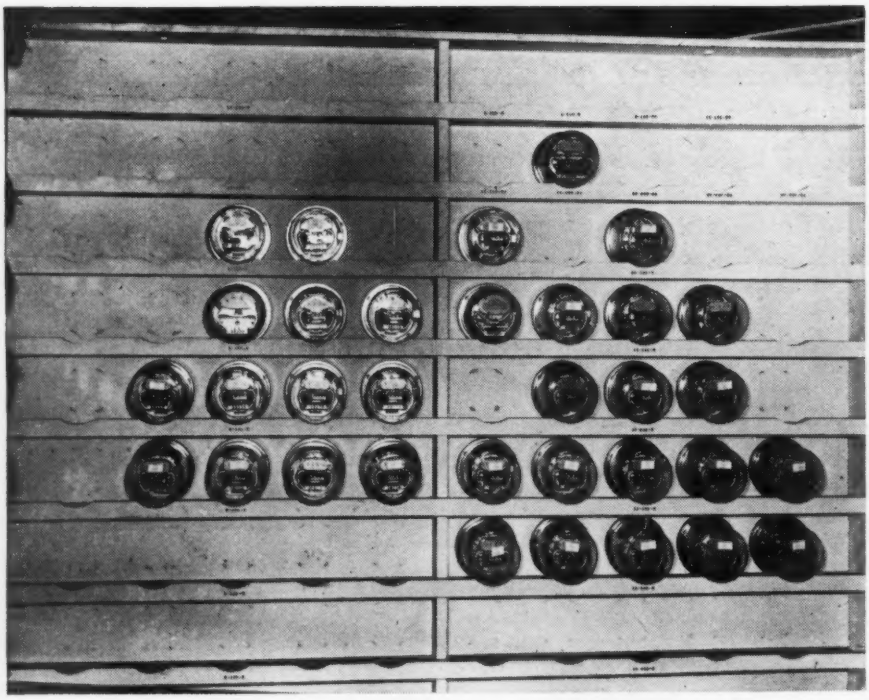

**PROTRACTOR DESIGN** for drawing polyphase vectors

To use the device, stick a pin through the hole in the center. Let the scale "A" be the voltage scale. Draw voltage line along "A." Mark position of "A" with dot at point where "A' meets circumference. If 30-deg angle of lag of current is desired, draw a line along "B" to proper length; this gives phase one. Now rotate the device counter-clockwise around the center until the 120-deg mark is opposite the point made at the previous position of "A." Draw a second line along "A," and follow with current line along "B." Again rotate until 120-deg mark is opposite second "A" line or point. Again draw lines A and B. This will give a 3-phase vector with lagging currents.

If leading currents are desired, use "B" for voltage lines and "A" for current lines and proceed as before, still using "A" as 120-deg spacing reference line.

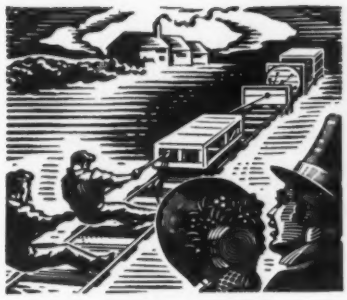
Angles lagging between 0-30 deg can be drawn by rotating device required degrees between 0 and 330 deg clockwise, using the finer subdivisions between these points; likewise, 0-30

# Rack For "S" Meters



**STORAGE RACK** for type "S" meters makes handling easy and reduces chances of damage. In the opinion of H. D. Noren, the designer from Coast Counties Gas & Electric Co, Santa Cruz, Calif., this cupboard-type arrangement is the best

# . . . . how much is it worth?



IN 1841, two years before the first telegraph line was installed in this country, and when there were but 27 states in the Union, John August Roebling was inspired with the idea of making a new kind of rope of unheard of strength and flexibility. His confidence in his idea caused him to risk everything he had on the development of his new rope.

How much is his confidence worth to Industry today, which couldn't turn a wheel without the modern wire rope?

Today, the John A. Roebling's Sons Company invests much time, effort and money in the development of improved products to keep alive the confidence of its many customers.

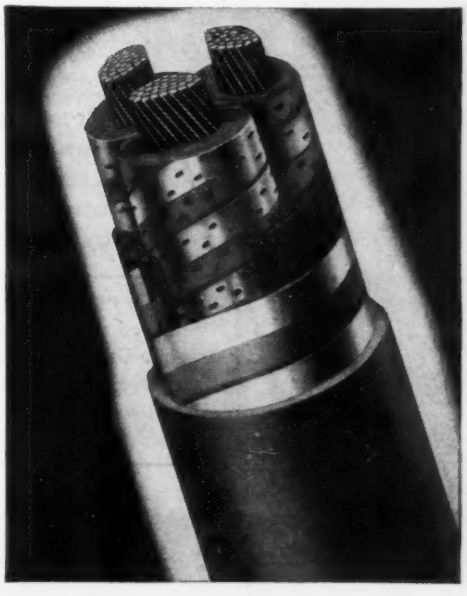
Roebling values this confidence as its greatest asset. That's why it offers you the greatest value for every dollar you invest . . . in *any* Roebling product.

**FOR PERFORMANCE—UTILITY ENGINEERS TURN WITH CONFIDENCE TO ROEBLING PAPER INSULATED CABLES**

AS WITH any product, the final test of Roebling Paper Insulated Cables is performance. But the confidence with which utility engineers specify Roebling cables means their performance can be predicted—in advance.

A typical example is Roebling Paper Insulated Cable (Shielded Type H) for underground power transmission. It's made of the finest available materials . . . in single or multiple conductors . . . in a wide range of sizes . . . in standard or special constructions. It's soundly designed and engineered. It is the best Roebling knows how to make.

And not only the cable commands your confidence. At Roebling, product and service go hand in hand. Experienced engineering service will help you get *all* the dependability and long life you pay for. Just call our nearest branch office and talk to your Roebling Field Engineer.



JOHN A. ROEBLING'S SONS COMPANY
TRENTON 2, NEW JERSEY
*Branches and Warehouses in Principal Cities*

Electrical Wire and Cable • Suspension Bridges and Cables
Aircord, Aircord Terminals and Air Controls • Lawn Mowers

**ROEBLING**

*A CENTURY OF CONFIDENCE*

HERE'S WHY WE KEEP SAYING..

"Permazinc"

...and not just galvanized

*Permazinc*, — Locke's *Quality Controlled* double hot-dip galvanizing — is an alloy-bonded protective coating that is actually a part of the steel.

Thorough cleaning to remove all foreign materials—proper drying—automatically controlled temperature of the molten zinc baths—experienced and skillful operators—careful setting of the molten zinc surface—these are but a few of the reasons why *Permazinced* Locke pole line hardware gives you added years of dependable performance.

For years *Permazinc* on Locke suspension and switch insulators has been a standard of comparison to operating men. Get this same dependability in pole line hardware by specifying Locke.

The *Permazinc* process is more fully described and illustrated in a folder recently issued. Get your copy by addressing a card or letter to Locke Insulator Corporation, Advertising Division, P. O. Box 57, Baltimore 3, Maryland.

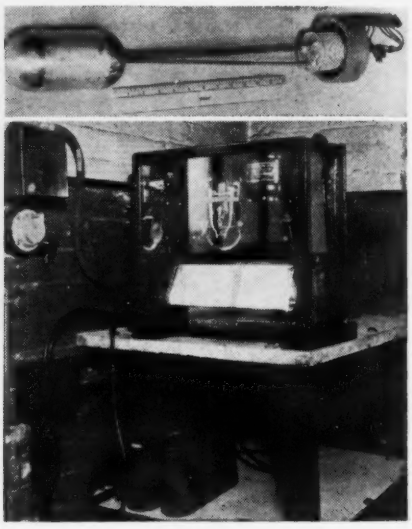
Locke POLE LINE HARDWARE and INSULATORS

LOCKE INSULATOR CORPORATION • BALTIMORE 3, MD.


deg leading, by rotating device counter-clockwise the required degrees between 30 and 60 deg. For angles between 60 and 90 deg add number of degrees on 0-330, or 30-60 scales to obtain required angle lead or lag.

•

## Electrical Strain Gage Measures Gas Flow



**DETECTING ELEMENT** (top) of flow meter has aluminum vane which extends into gas stream and metal bellows which houses the electrical elements. The element is inserted through a tapped hole in gas main. Variations in gas stream flow are measured by a galvanometer (bottom) and recorded on chart

ENGINEERS of Consolidated Edison Co of New York, Inc, have devised a new type of meter for use in studying flow conditions in gas mains. The instrument employs electrical principles.

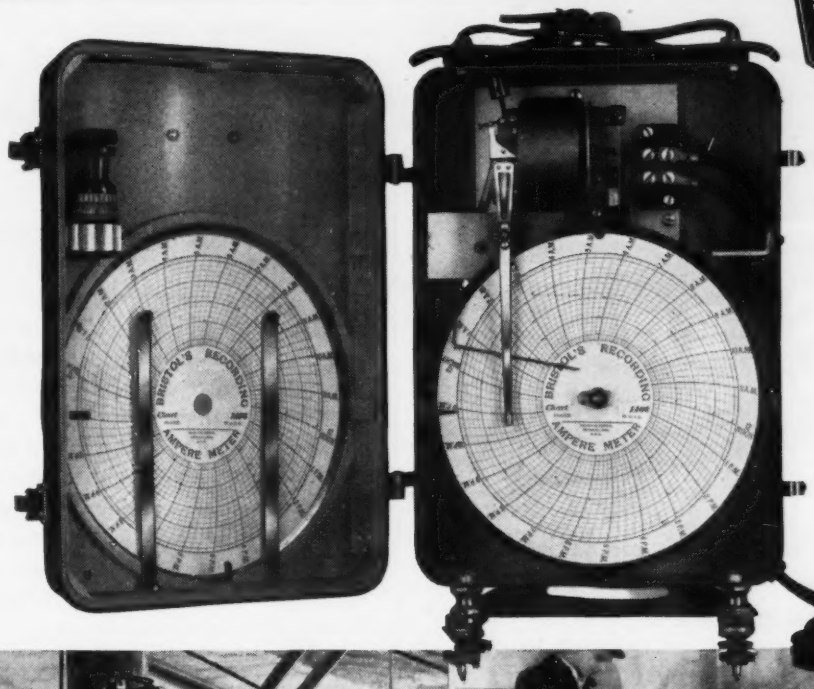
While still in the experimental stage, the device is expected to overcome installation difficulties experienced with other types of gas flow meters. The new meter can be inserted in a gas main through a tapped hole. Other meters require that the gas main be cut through unless provision for the meter's installation was made at the time the main was put in.

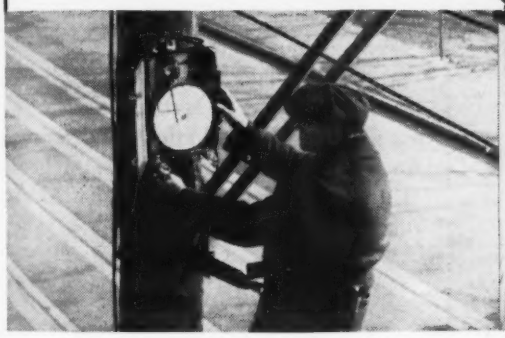
This flow meter's operation is based on an electrical strain-gage, a hair-like alloy wire 0.001 in. in diameter which changes its resistance as it is extended or compressed. Four of these gages are mounted in a Wheatstone bridge circuit on a 3-in. piece of spring steel. One end of the steel strip is anchored to the gas main;

# Keep Your Finger on CURRENT Events

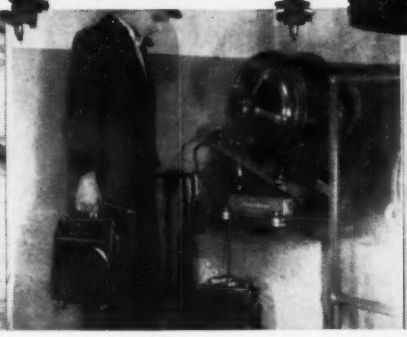
STOCK ITEM
For immediate shipment

## WITH BRISTOL'S ALL-PURPOSE PORTABLE RECORDING AMMETERS AND VOLTMETERS

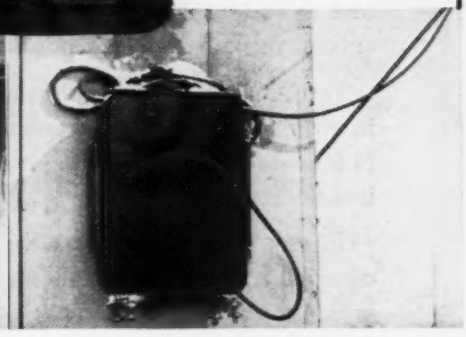


Pole mounting



Portable



Wall mounting

Here are a couple of seventeen-pound trouble-shooters that are worth their weight in gold. They're rugged, weatherproof instruments that can stand a lot of handling, yet retain their accuracy and give you convenient, dependable records.

Mount them outdoors on a pole or a wall . . . carry them down into a cellar or manhole . . . these Bristol All-Purpose Recording Instruments will point the finger at trouble and write it down for the record. Bulletin E1100 tells more. **THE BRISTOL COMPANY**

**116 Bristol Road, Waterbury 91, Conn.**
The Bristol Co. of Canada, Ltd., Toronto, Ontario.
Bristol's Instrument Co., Ltd., London N.W. 10, Eng.

**THREE MODELS**

**SINGLE PEN.** Inexpensive instrument for quickly analyzing conditions, investigating complaints, making current surveys, general testing, etc.

**DOUBLE PEN.** Records two different values simultaneously on one chart. Used for checking balance on three-wire systems and to study sections of a circuit.

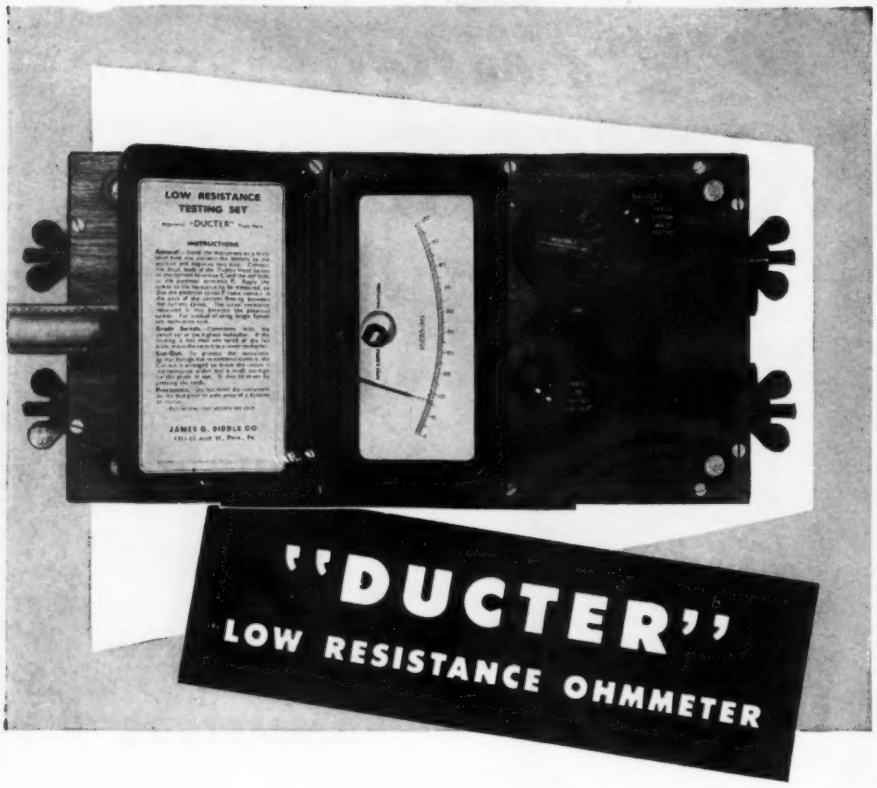
**TRIPLE PEN.** Records three different values simultaneously on one chart. Used for investigating conditions in polyphase networks, for determining conditions at load centers and at ends of feeders.

BRISTOL

*Gives you the FACTS when and where you want them*

**MAKERS OF** Metameters, Recording Voltmeters, Ammeters, Thermoverters, and a broad line of Automatic Controlling and Recording Instruments.

**AUTOMATIC CONTROLLING AND RECORDING INSTRUMENTS**

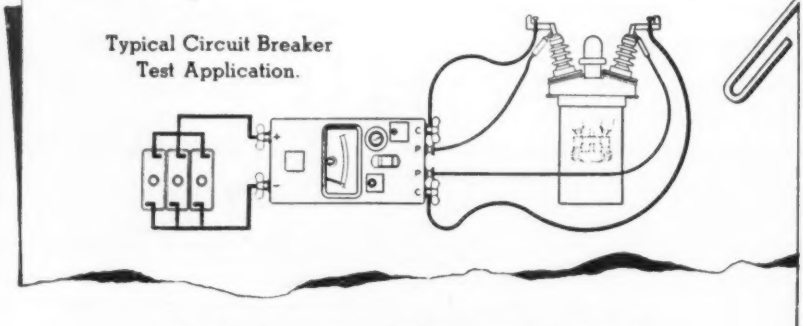



HERE'S a rugged, portable, direct-reading, and yet accurate *field* instrument for measuring resistance down to .000001 ohm (1 microhm) that can be taken right to the job and operated by *one man* simply applying a pair of hand spikes and reading the position of a pointer over a scale.

The "Ducter" Ohmmeter is invaluable for detecting trouble in switches and circuit breakers . . . for measuring any type of low electrical resistance or contact such as armature and transformer windings, soldered joints, etc.

*In one operation,* the "Ducter" Ohmmeter performs what otherwise requires more complicated equipment as well as both training and practice in low resistance measurement. You'll find the story of this member of the famous "Megger"* family of resistance measuring instruments in your free copy of Bulletin 24-25-W.

*REG. U. S. PAT. OFF.




**JAMES G. BIDDLE CO.**

ELECTRICAL & SCIENTIFIC INSTRUMENTS

1316 ARCH STREET • PHILADELPHIA 7, PENNA.

the other supports a steel tripod extending into the gas stream. At the end of the extension is an aluminum cylinder closed at the ends.

When gas flow in the main changes, the degree of deflection of the hollow cylinder changes. As the assembly, with the exception of the spring steel, is rigid, the entire motion is transferred to the spring to which the strain-gages are attached. Since tension increases the normal resistance of 120 ohms in each element, and compression reduces the normal resistance, movement of the hollow cylinder is noted electrically.

The electrical changes result in a flow of current through a sensitive galvanometer which is deflected. That, in turn, automatically controls a slide wire resistor which restores balance to the galvanometer. A pen mechanically attached to the slide wire indicates the change graphically on a moving chart. The strain produced in the gages is proportional to pressure on the aluminum cylinder. The pressure is proportional to the square of the velocity of the gas stream. A balancing circuit is incorporated in the recorder so that it shows a linear response to velocity changes.

A variable shunt resistance is used in the measuring circuit to compensate for changes in static pressure of the gas which would affect its density. An integrator, mechanically attached to the recorder, registers the total cubic feet of gas flowing.

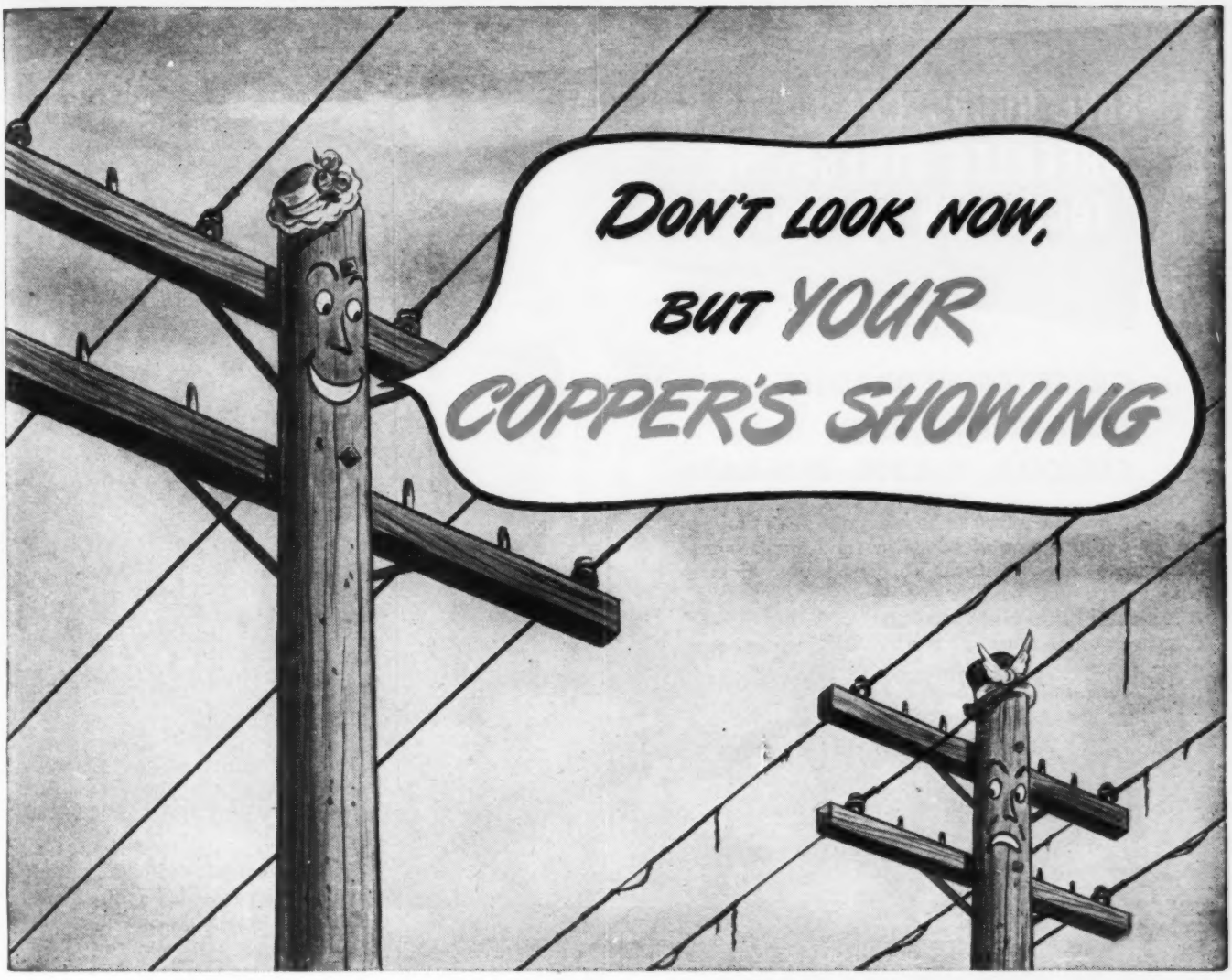
•

## Terminal Pole Design for Potheads and Arresters

**M. H. POWELL**
Supt Distribution,
Public Service Co of Colorado
Denver, Colo.

TO MEET requirements of a cable terminal pole for mounting lightning arresters and cable potheads, Public Service Co of Colorado developed the structure shown. The need for providing mounting facilities for the lightning arresters resulted in this arrangement of crossarms.

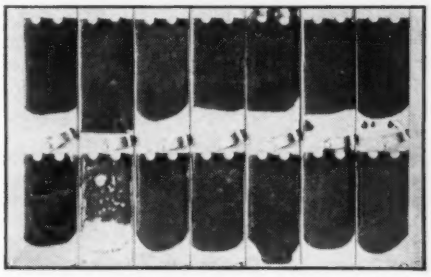
In cases of double-circuit lines, two such pole structures are set at an angle of 45 deg with respect to the line and about 10 ft apart. This keeps the cable terminal and lightning arresters of each circuit widely sepa-



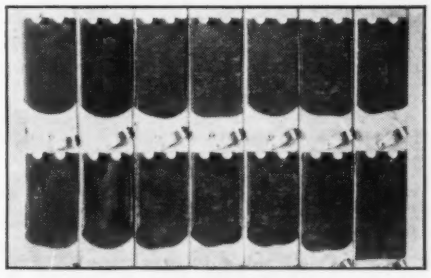

"Yes, I know. This old-fashioned weatherproof keeps coming apart and festooning. What should I do?"

"Just specify URC Weatherproof the next time. Weatherproof now lasts longer because of improved, URC saturants and finishers—new manufacturing techniques."

URC Weatherproof has ended festooning. Weather tests have proved its superiority. Just specify Anaconda.



*THE OLD—After rigid aging tests, old-type saturants and finishers reveal lack of uniformity in resistance to flow and poor stability.*



*THE NEW—After undergoing the same tests, URC saturants and finishers show far superior qualities of stability and resistance to flow.*

**For continuity of service ... Anaconda DURALINE or TRIPLE BRAID URC**

**LOOK TO *Anaconda* FOR WEATHERPROOF THAT LASTS!**

ANACONDA

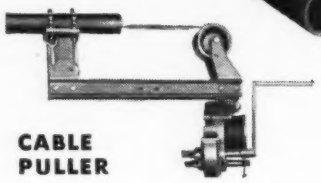
# SAVE HOURS, CUT COSTS WITH GREENLEE TIMESAVING TOOLS FOR ELECTRICIANS

## GREENLEE HYDRAULIC BENDER FOR PIPE, CONDUIT, TUBING, BUS-BARS

With a GREENLEE Bender one man quickly makes smooth, *accurate* bends in rigid and *thin-wall* conduit, pipe up to 4½", tubing, bus-bars. No kinking, wrinkling or other damage to conduit this way. And, since the GREENLEE is compact, portable, bending can be done *right on the job*. Easily pays for itself on first few jobs through big savings in time, labor, materials.

**KNOCKOUT TOOLS**

Eliminate tedious drilling and filing to enlarge a hole for conduit or cable. In 1½ minutes or less cut smooth openings up to 3½" in bakelite, hard rubber, or metal up to ⅛" thick. Turned with an ordinary wrench.



**CABLE PULLER**

Easy-operating, compact unit for 7,500 pound pull. Fastens direct to conduit for pulling in line with conduit . . . no loosened hangers. Attachment available for concealed conduit work.

**BORING TOOLS**

Designed especially for electricians to produce smooth openings in a hurry: No. 16 Unispur Electricians' Auger Bit . . . No. 21 Solid-Center Electricians' Auger Bit . . . No. 48 Bell Hangers' Drill . . . No. 900 Bit Extension.

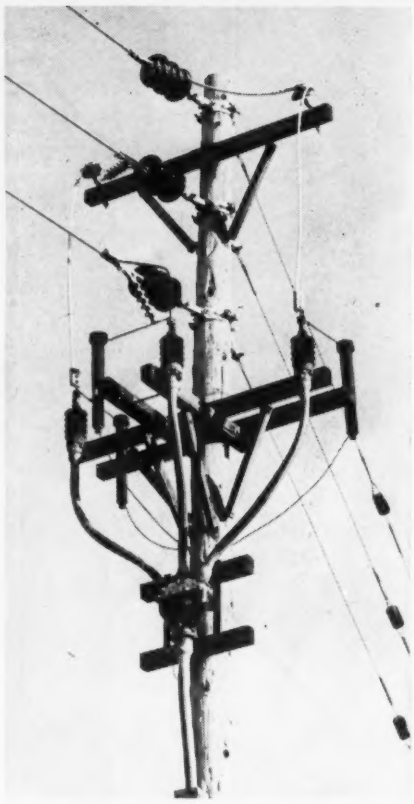
**HAND BENDER**

Quickly makes small-radius bends in steel, copper, brass and aluminum tubing, conduit, or pipe . . . without kinks or flattening. Especially designed to make neat bends up to 180° for sharp nooks and corners.

TOOLS FOR CRAFTSMEN

GREENLEE

**WRITE GREENLEE TOOL CO., 1812 COLUMBIA AVE., ROCKFORD, ILL.** for complete data on above equipment as well as Greenlee Joist Borers • Pipe Pushers Expansive Bits • Spiral Screw Drivers • Automatic Push Drills and many other quality tools.

**SINGLE-CIRCUIT** terminal pole design accommodates cable terminals and lightning arresters and provides ample climbing space

rated. Communication of pole top fires or other trouble from one circuit to another is thus prevented.

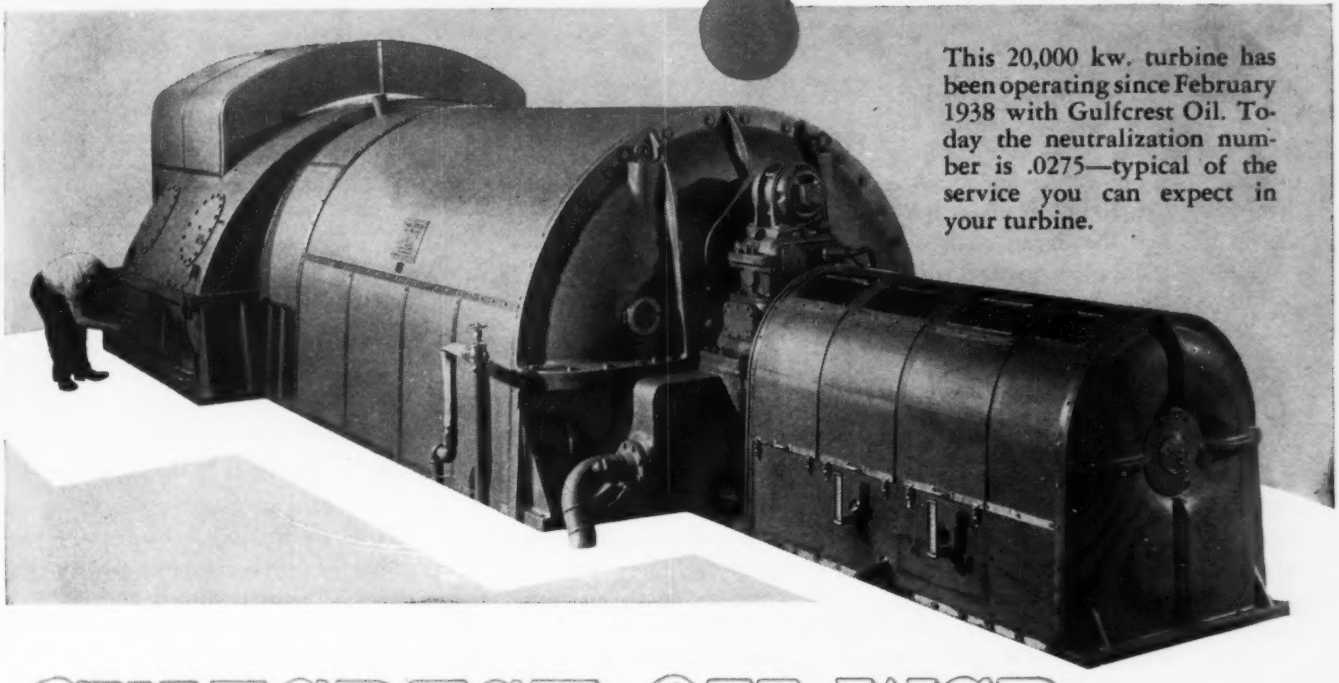
•

## Zigzagged Arms For Temporary Line

**ZIGZAG CROSSARMS** on a 220-kv temporary bypass line were used by Pacific Gas and Electric Co when highway construction required relocation and higher towers. Ample strength for the three 795,000-cir mil ACSR conductors was provided by this simple single-pole construction

# A vital consideration in turbine oil selection

## WHAT WILL THE NEUTRALIZATION NUMBER BE AFTER 5 YEARS?



This 20,000 kw. turbine has been operating since February 1938 with Gulfcrest Oil. Today the neutralization number is .0275—typical of the service you can expect in your turbine.

## GULFCREST OIL WCR maintains a remarkably low neutralization number indefinitely!

ONE of your first questions in turbine oil selection! How long until the neutralization number starts to climb—how long before you must shut down for system cleaning?

When you use Gulfcrest Oil WCR, the answer is indefinitely! Scores of operators report that after 9 years' or more service the neutralization number of Gulfcrest Oil WCR in their turbines continues to be under .065, with no indication of an increase in the future.

Another important reason why Gulfcrest Oil is the logical choice for your turbine! Alchlor processed, rust and oxidation inhibited, Gulfcrest is the world's finest turbine oil. Send the coupon at right for a booklet which gives you complete facts on this superior oil.

GULF INDUSTRIAL LUBRICATION

**Gulf Oil Corporation · Gulf Refining Company**

*Division Sales Offices:*

**Boston · New York · Philadelphia · Pittsburgh · Atlanta**
**New Orleans · Houston · Louisville · Toledo**

Gulf Oil Corporation · Gulf Refining Company EW
3800 Gulf Building, Pittsburgh 30, Pa.

Please send me, without obligation, a copy of your booklet "Gulfcrest Oil for Steam Turbine Lubrication."

Name.....

Company.....

Title.....

Address.....

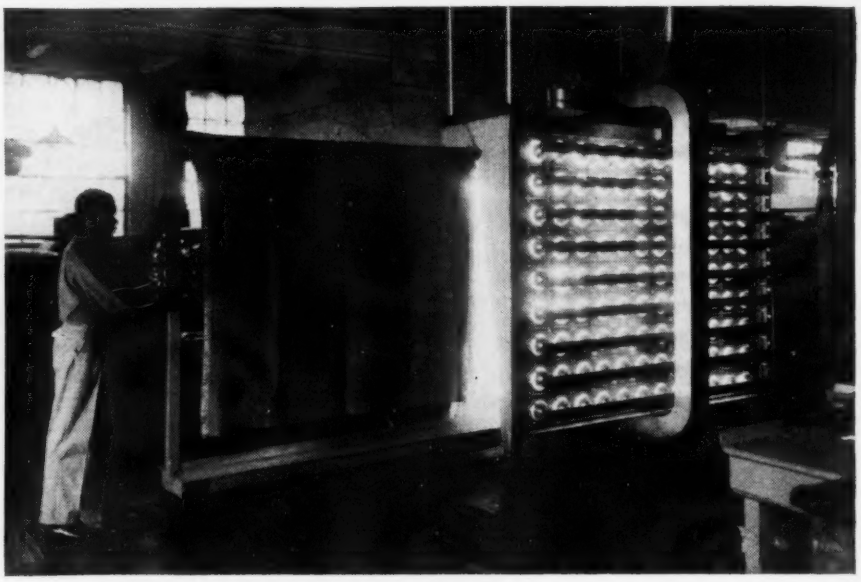
# LOAD BUILDING

## Infrared Makes Short Work of Wet Blankets

FOR DRYING one blanket, about 1 kwhr. That's the energy consumption for an infrared dryer used by the Elite Laundry Co, Baltimore, Md. According to *Power Pictorial*, published for industrial customer information by the Consolidated Gas, Electric Light and Power Co of Baltimore, lack of sufficient space for air drying caused the laundry to turn to infrared about a year ago. Since then more than 10,000 blankets have passed through the dryer, each one coming out without shrinkage, softer and fluffier than when air-dried.

W. H. Morgey, production manager of the laundry, says:

"With infrared drying, we can handle our blanket work in a fraction of the space otherwise required and on a definite, fixed time schedule. Before we had it, hours were needed for blankets to dry and in humid weather, which often occurs during our busy season, blankets hanging overnight were still damp the next morning. With infrared it takes just 4 min to dry two blankets, regardless of weather conditions."



**SOFTER, BETTER FINISH** than with air drying is given to blankets by this infrared dryer, turning out two in 4 minutes

The dryer consists of two facing panels, 10 ft long, 8 ft high, each containing 108 150-w lamps, and spaced 3½ ft apart. Means are provided for removing moist air from the dryer. In the occupied floor area of 35 sq ft, about 250 blankets can be dried in an 8-hr day.

• • •

## Electric Cooking Attracts Motorists

**ELECTRIC LIGHTING PROMISES,** and electric cooking provides, good food

EFFECTIVE LIGHTING and all-electric cooking equipment are two major factors in attracting motorists to Whitson's new drive-in restaurant near Birmingham, Ala. On an average day, H. H. Whitson serves approximately 1,200 orders, and more than 2,200 on Sundays.

The building is of modern design, with glass brick front, solid glass door and large windows. Floodlights and a neon sign beckon to motorists far on the highway. The drive-in accommodates 16 people in four booths and seats 26 at the counter.

Electric equipment on the back bar includes a reach-in refrigerator, refrigerated salad case, two toasters, grill, two-unit hot plate, two fry kettles, and two coffee makers. All

# What's cooking in a "JET"

Diameter of Thermocouple compared with ordinary Pin. Temperatures only register at point of Thermocouple Junction.

TO RECORD the temperatures at specific points in the anatomy of a "jet" is a tough assignment, but this small-diameter thermocouple, manufactured by Precision Tube Company of Philadelphia, does it.

Thin as a thread, it can be employed effectively in lengths up to 20 feet—laid along surfaces, snaked around obstructions, pushed down channels, fed through tiny apertures, sealed in walls and left protruding into space. Temperatures are only registered at the end where the thermocouple junction is located. Thus when inserted into pressure and exhaust chambers of jet engines, it can be maneuvered in any direction to obtain temperatures of gases with pin-point accuracy at different points.

Top performance has been achieved by use of Advance* Wire—because, in its finer forms, it has a negligible temperature coefficient of resistance, only ±.00002/°C; develops maximum and uniform thermal e.m.f. against copper; is extremely ductile; is resistant to heat and corrosion. An insulated winding of Advance is inserted into a seamless copper tube, and themocouple junction is made by cutting the assembly to length and brazing or welding the wire and the tube at one end.

Rapid response to temperature change, and small heat storage are characteristic of this thermocouple — permitting accurate readings to be obtained almost instantly. Moreover, its small proportions render it ideal for use with midget-size mechanisms.

Whether your product be small or large, if its successful operation rests upon application of special purpose alloys, send your specifications to us. We will supply the alloy with electrical and physical properties best suited to your requirements.

SPECIAL PURPOSE ALLOYS SINCE 1899 — D/H — TRADE MARK REG. U. S. PAT. OFF.

## Driver-Harris COMPANY

HARRISON, N. J.

BRANCHES: Chicago • Detroit • Cleveland
Los Angeles • San Francisco • Seattle

THE B. GREENING WIRE COMPANY, LTD.
Hamilton, Ontario, Canada

*Trade Mark Reg. U. S. Pat. Off.

Here's what to look for in TAPE!

CORRECT UNWINDING TENSION
NON-RAVELING—CLEAN CUTTING
HIGH TENSILE STRENGTH
TIGHT STICKING—FAST HOLDING
GOOD DIELECTRIC QUALITIES
STRAIGHT, EASY TEAR-OFF
GUARANTEED FOOTAGE

You will find all these qualities in ACCURATE tapes. ACCURATE tapes — friction and rubber — are made in the modern ACCURATE plant devoted exclusively to the manufacture of fine electrical tapes. Although ACCURATE tapes are produced to exacting standards under rigid quality control and from the finest materials obtainable they cost no more than other tapes.

Electricians know good tape makes their work easier and faster. Good tape—ACCURATE tape—handles fast and easy. It makes smooth joints that can't be beaten. ACCURATE tapes are real time and money savers and every roll is guaranteed for full footage. Ask for it by name—ACCURATE.

ACCURATE
MFG. COMPANY
General Offices & Plant: Garfield, New Jersey

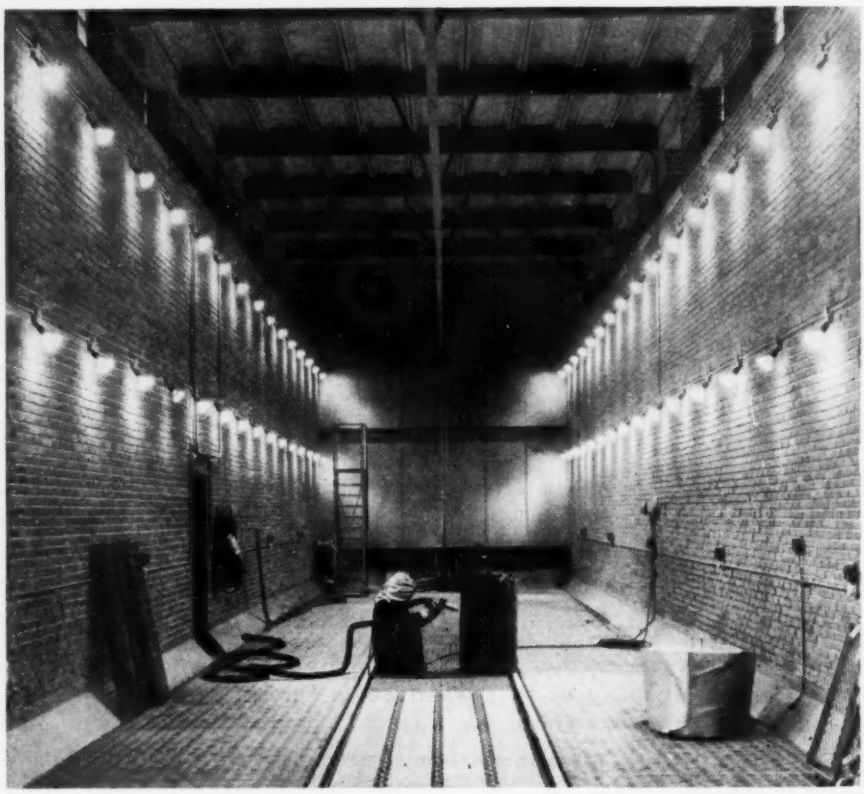
equipment is illuminated by fluorescent troffers. On the outside of the counter is an automatic electric roll warmer and a three-unit coffee maker.

The automobile trade is served from a separate kitchen in the back which repeats the open glass front. Here, electric equipment includes slicers, steak-cubers, ice cream case, two grills, two toasters, fry kettle, beverage cooler, refrigerated orange juice dispenser, ten mixing machines, and a meat grinder. Both kitchens are served by an 80-gal electric water heater, two reach-in refrigerators, a walk-in box, an automatic electric dishwasher and potato peeler. The dining area is cooled by a 5-ton air-conditioning unit. Recessed fluorescent tubes in the ceiling furnish attractive lighting. Total load is 77 kw, most of it in use 24 hours of the day.

Birmingham Electric Co engineers worked with Mr Whitson on the arrangement and selection of equipment. Success of electric cooking in this restaurant has sold the owner on its use in another drive-in which he is planning.

• • •

## Tough Lamps Developed for Shot Blast Lighting



**LAMPS TAKE A BEATING** when a locomotive in manufacture is run into this room for shot blasting

**N. B. BURROUGHS,**
Electrical Engineer
General Electric Co, Erie, Pa.

LIGHTING large-scale industrial shot-blasting operations without demolishing the lighting equipment is a problem. Usual practice is to enclose standard filament lamps in heavy glass globes. This reduces breakage, but is cumbersome and costly.

At General Electric Erie Works, shot blasting on electric or diesel-electric locomotives is done in a separate building constructed for the purpose. Special lamps are provided to illuminate the work.

The building, 87 ft long, 18 ft wide and 20 ft high, houses 68 PAR-38, 150-w flood lamps. These are installed on the walls at two levels, 16 and 10 ft above the working floor on 5-ft spacings. They are mounted to direct the illumination downward at 45 deg. Approximately 30 ft-c of illumination is provided.

This installation has been used for more than a year. The lights are

# 4 ADVANTAGES

## that are yours with

ANOTHER DOW PRODUCT

**penta**

**-chlorophenol**

1. You get full strength preservative—measured dependable preservative action.
2. You know what you're getting with Pentachlorophenol—same today—yesterday—tomorrow.
3. You can duplicate service records. Treating solution is scientifically controlled.
4. You get a clean treatment—poles are easy to handle—easy to work on.

***For further information, talk to your treater or call on Dow.***

**THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN**

DOW

CHEMICALS INDISPENSABLE TO INDUSTRY AND AGRICULTURE

# CRESCENT
## Aluminum Building Wire

An excellent alternate for copper

COSTS LESS!

PROMPT SHIPMENT!

Aluminum feeders, particularly in the larger sizes show a substantial saving in cost per ampere of useful circuit capacity in most cases as compared with copper. CRESCENT Aluminum Building Wire is made with ENDURITE heat resistant insulation in sizes number 4 AWG to 1,000,000 C. M. as Type RH - 75°C - 600 Volts. Send for Bulletin 471 for complete information.

CRESCENT
WIRE AND CABLE

CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, N. J.


in use 50 hours each week. Lamp replacements are held to 25 percent per month, but not for failure due to shattering. Lamps that are replaced are those that have burned out at normal life.

•

## Electric Hay-Drier Increases Farm Income

PROMOTION of the electric hay-drier in low country farming by South Carolina Power Co is increasing the quality of cured hay and increasing farm income.

The first hay-drier was installed in Ridgeland County and has been highly successful. The installation consists of a slatted floor on which the hay is piled and through which air is forced by means of a 3-hp motor blower.

There are two types of hay driers. One has a main duct built down the center of the barn with lateral tunnels running out from it. Slits along the bottom allow air to escape upwards. A fan pulls air from the outside and blows it through the tunnels and up into the hay. The other type depends on a slatted floor, with air pulled in from the outside and blown up through the slats.

Installation costs range from $500 to $1,000, depending on barn size.

Tests show that it requires approximately 53 kwhr to dry one ton of hay under normal conditions, with costs negligible to the added value of the hay. In electric hay-drying, the farmer gets approximately 54 percent No. 1, 34 percent No. 2, and 7 percent No. 3 hay with about 5 percent foreign matter and waste. In field-curing, the average runs 9 percent No. 1, 26 percent No. 2, and 35 percent No. 3, with 30 percent low quality containing more than 15 percent foreign matter.

Barn-cured hay retains 40 percent more of its leaves and 60 percent more of its color than field-cured hay.

The success of this first hay-drier on the system has proved a great stimulant to other installations. This promises to become a major farm load in the future. Clemson College and the utility's rural department, under direction of Percy Miley, are coordinating efforts in wider use of the electric drier.

Jenkins Bros. also make Diamond Seal Friction and Rubber Tapes which meet ASTM and Federal Specifications.

IN winter's worst blizzards—in any weather, anywhere, Gold Seal sticks—keeps its "tack"—never lets you down. That's because every inch of Gold Seal's base cloth is thoroughly impregnated with super-quality friction compound.

What's more, Gold Seal Tape is high in dielectric strength. It won't ravel, peel, or smear . . . tears clean without tugging. Cellophane wrapped, in single-roll boxes or the handy 10-roll container. The next time you order, specify Gold Seal . . . it's your best buy in tape. Jenkins Bros., Rubber Division, 80 White St., New York 13, N. Y.

**JENKINS**

REG. U.S. PAT. OFF. TRADE JENKINS MARK Jenkins Bros.

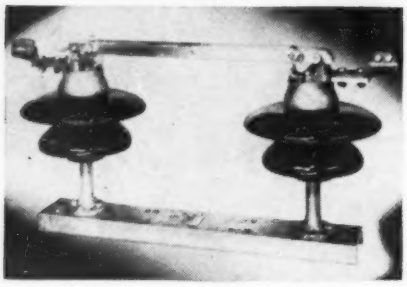
# Gold Seal Tapes

**FRICTION and RUBBER TAPES**

**MADE BY JENKINS BROS. . . . MAKERS OF FAMOUS JENKINS VALVES**

# NEW EQUIPMENT

## Disconnect Switches



A NEW LINE of hook-operated disconnect switches for general outdoor use has been announced by Hi-Voltage Equipment Co, 4,000 East 116th St, Cleveland 5, Ohio. The line is manufactured in single-throw, double-throw and transfer types. Capacities range from 200 to 2,000 amp and from 7,500 to 115,000 v.

Features of construction are stated to be:

(1) Blades of the 400- to 1,200-amp models are carried on a hinge which is independent of the hinge end contact.

(2) Contacts at both ends of the blade are flexible and self-aligning. Contact pressure is maintained by stainless steel springs.

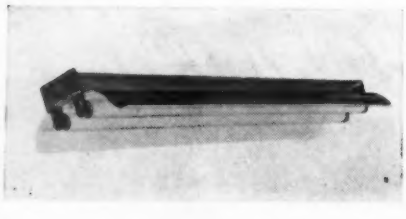
(3) Lock mechanism is independent of the contact, and incorporates a positive, pry-off action. The action makes easy opening of the switch under ice conditions or where a pull with the switch stick is parallel to the blade.

(4) Models of 600- to 2,000-amp capacity have silver-nickel contacts brazed to copper.

•

## Fluorescent Unit

A NEW all-purpose industrial fluorescent lighting unit has been released by Mitchell Manufacturing Co, 2525 Clybourn Ave, Chicago 14, Ill. The new Model 2098 uses two 40-w lamps mounted in reflector 11 in. wide and



finished in glossy baked white enamel.

The unit features steel wireway construction, with brackets and knockouts for chain suspension, rigid rod mounting or surface mount, singly or in continuous rows. It is equipped with ballasts, sockets and FS-4 starters, and operates on 110-125 v. 60-cycle circuits.

•

## Aviation Marker Light

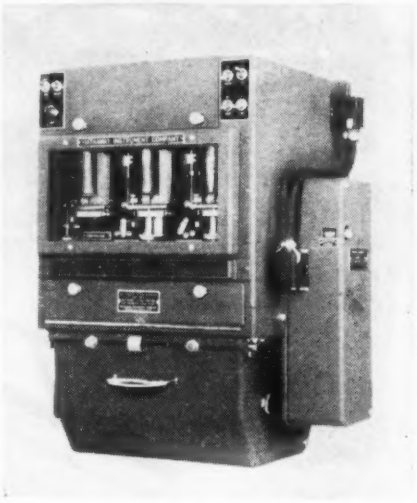
FOR AIRPORT RUNWAYS a new day or night marker light is announced by Westinghouse Electric Corp, East Pittsburgh, Pa. Designed to meet CAA Specification L-802, its brightly colored cone serves to identify the runway or strip in daytime while the light at the top provides an elevated marker at night.

Lens assembly is designed to give asymmetric light distribution with the major portion of the light in line with the runway. Lenses and frame are in-

dexed and the entire assembly can be oriented by rotating lens and cone support on the shaft. Rifle sights enable aligning the unit with runway when installing or after relamping.

The elevated marker light can be used on either 6.6-amp series circuits or 120-240-v multiple circuits. Five steps of brightness are available from 16 cp to 1,600 cp when a 30-w series lamp is used and the circuit is controlled by a standard five-step brightness control regulator.

## Automatic Oscillograph



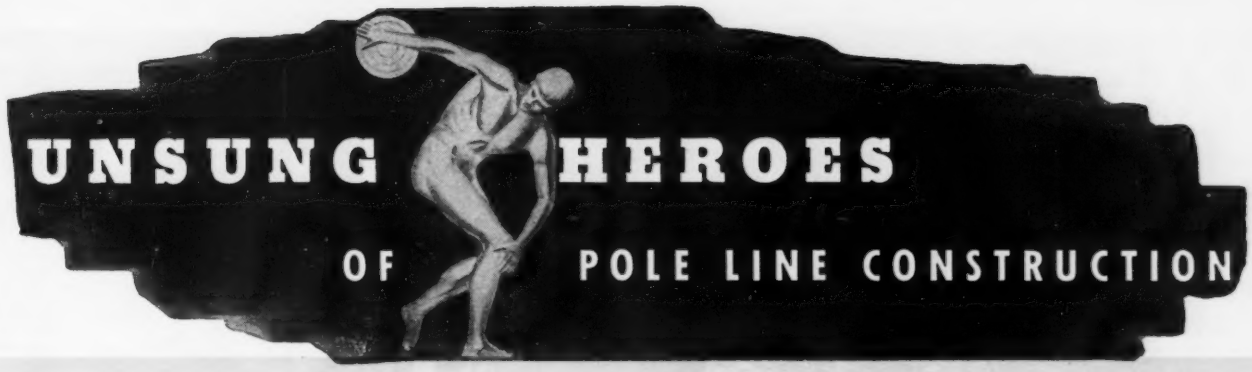
AVAILABLE for the central-station engineer is the new type RS-9 automatic oscillograph developed by Hathaway Instrument Co, 1315 South Clarkson St, Denver 10, Colo. This twelve-element instrument has been designed for automatic recording of faults or staged system testing; it can be used as a portable instrument or for permanent switchboard installation.

Features of the instrument are reported to be: The RS-9 records as many as 100 transients without attention. It will start and reach full recording speed in 1/500 sec or $\frac{1}{8}$ cycle on a 60-cycle system. After recording until the fault is cleared, the instrument stops automatically and resets in preparation for the next fault. The unit can be supplied with built-in neutral current, over-current, and under-voltage starting relays. With twelve galvanometers, twelve quantities can be recorded at once, such as neutral current, phase currents and voltages, and power.

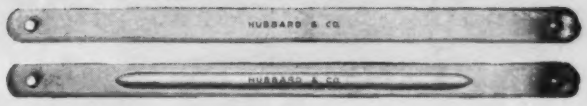
•

## Electric Tachometer

A NEW hand-held electric tachometer which weighs only 3 lb has been announced by the Special Products Division of the General Electric Co, Schenectady, N. Y. The instrument is designed to give direct readings of linear speeds from 10 to 10,000 fpm, and of rotational speeds from 100 to 10,000 rpm. Using accessories, rotational




**Simple things, CROSS ARM BRACES, just a strip of flat steel with a hole punched in each end, but most important to a pole line. Hubbard Braces are fabricated from the best, new, open-hearth steel and all corners are rounded to protect linemen from sharp projections. For the engineer who wishes additional strength on the compression side of the arm, the ribbed brace is provided and offers approximately 25% added protection.**



HUBBARD FLAT AND RIBBED
CROSS ARM BRACES

HUBBARD ANGLE CROSS ARM BRACES, for heavy construction, are supplied in a range of spreads and drops to meet the requirements of any standard construction. Angle size runs from 1½ to 2-inches. At the pole attachment hole, the angle is so formed that wrench clearance is provided. Attachment is by ⅝-inch Machine Bolt at the pole and ½-inch Carriage Bolts at the arm.

HUBBARD ANGLE CROSS ARM BRACE

**DRIVE POINT MACHINE OR CROSS ARM BOLTS are roll-threaded to provide a "finger-fit" for the full length of the thread. The "Drive Point" feature enables the bolt to be used as a drift pin for the alignment of holes slightly off center. This operation must be carried out with caution so as not to injure the threads. "Drive Point" also facilitates the application of nuts and allows bolts to be driven out of the pole for reclamation without injury to the threaded end. The major portion of Hubbard bolts of all types have this feature.**

HUBBARD DRIVE-POINT
CROSS ARM OR MACHINE BOLT

HUBEYE BOLTS are furnished for attachments of any kind where a thimble would normally be used. The eye of the bolt is drop-forged to a shape which provides a perfect "built in" thimble. Strand may be looped around the Hubeye with complete protection. Side walls of the eye retain the roundness of the strand. There is no possibility of kinks or strains at the loop. Hubeyes are a thoroughly tried and proven product.

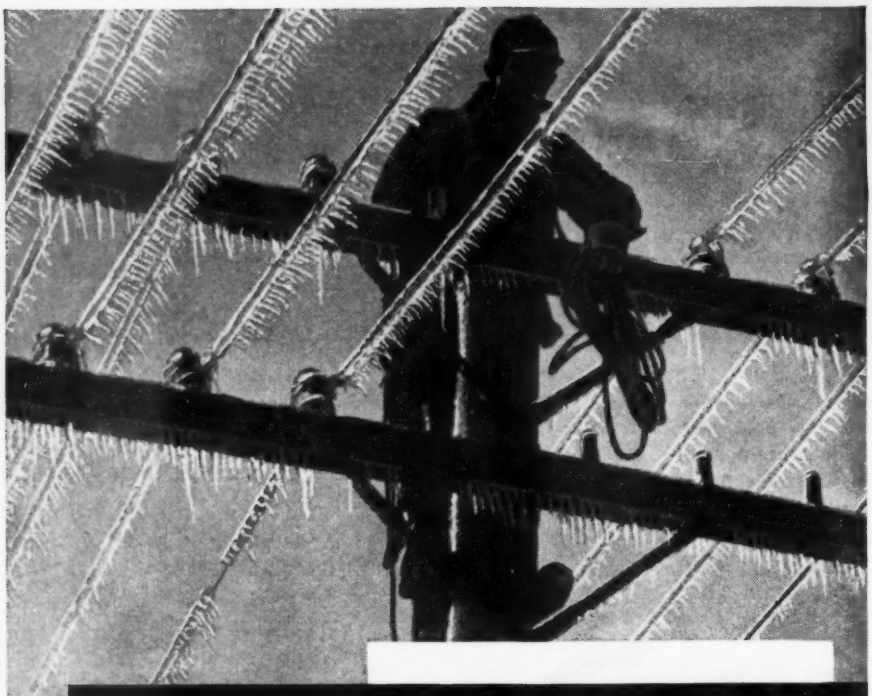
HUBEYE DRIVE-POINT BOLT

**STANDARD HUBBARD OVAL-EYE BOLTS are an old line item still much used in many sections. Hubbard Eye Bolts are all drop-forged with an eye that is stronger than the shaft of the bolt. Made from the best, new, open-hearth steel and Hubbard Double-Dip Hot Galvanized.**

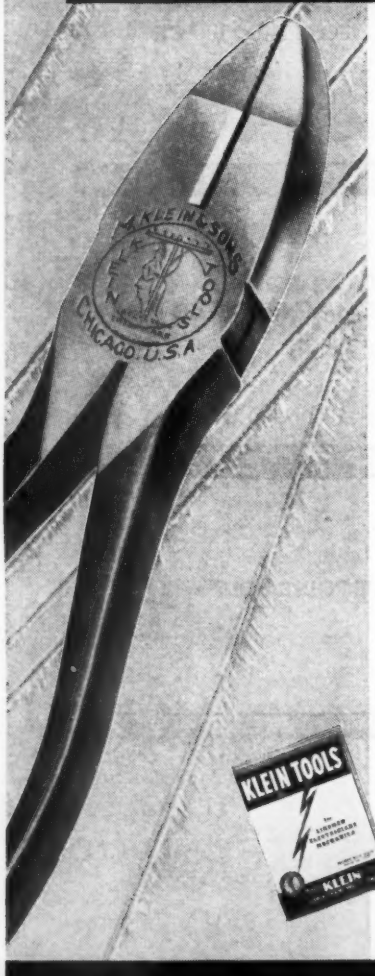
HUBBARD OVAL-EYE
DRIVE-POINT BOLT

**HUBBARD AND COMPANY**

**PITTSBURGH CHICAGO OAKLAND CALIF.**



# KLEIN PLIERS!




## . . . PREFERRED BY LINEMEN

Wherever there are linemen . . . whatever the job—tough or routine—you'll find Klein Pliers.

There's good reason for this widespread preference that began when the electrical industry was in its infancy and has continued on through the years.

Linemen know they can depend upon the quality and performance of Klein Pliers. Drop forged from the finest alloy steel, each pair is individually tempered and tested—has the proper balance—just the right spring to the handles to minimize hand fatigue. A fitted hinge keeps jaws perfectly aligned—the carefully matched knives cut swiftly, surely and stay keen for years.

The complete Klein line includes pliers for every use. Your supplier will fill your order as quickly as possible.

**Ask Your Supplier**

**Foreign Distributor: International Standard Electric Corp., New York**

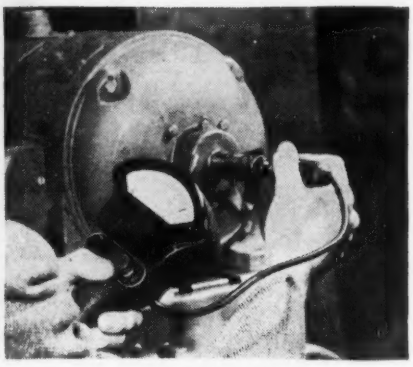
*A copy of the Klein Pocket Tool Guide, showing the Klein line and containing valuable tool information, will be sent on request.*

*Since 1857*

**Mathias KLEIN & Sons**

**Established 1857** — **Chicago, Ill., U.S.A.**

3200 BELMONT AVENUE, CHICAGO 18, ILLINOIS

speeds from 10 to 100,000 rpm may be measured. The instrument can measure both clockwise and counter-clockwise rotation.

Typical applications include measuring rotational speeds of motors, generators, turbines, and engines; measuring cutting speeds in fpm on lathes and milling machines, and measuring linear speeds of planer beds, shapers, band saws, and conveyor belts.

The tachometer consists of two units—the head, which is placed in contact with the moving object, and the indicating unit to which the head is attached by a flexible electric cable. Speed ranges can be changed while the spindle is rotating because there is no gear transmission to shift for various speed ranges. Accurate speed indications are assured by a low driving torque of only ¼ oz-in. The instrument cannot be damaged by overspeeding according to the manufacturer.

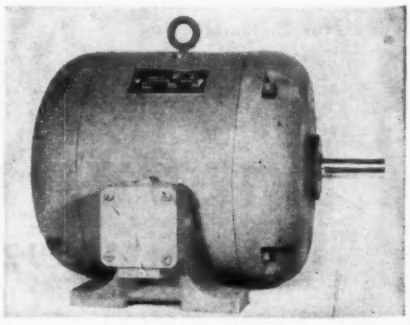
•

## Totally Enclosed Motors

A NEW SERIES of totally enclosed, 3-phase, squirrel-cage motors has been developed by Kato Engineering Co. Mankato, Minn. Sizes available are 1½, 2 and 3 hp.

Stator windings are submerged in varnish and each is twice baked at moderate temperature until the varnish is properly cured. Rolled sheet copper is used for the squirrel-cage element. The rotor is equipped with Norma-Hoffman grease-sealed, cartridge-type bearings.

Frame and end bells are of cast iron. A lifting ring is furnished. Holes in mounting feet are spaced in accordance



# When Your Customers Ask . . .

# *"What about Multi-Breakers?"*

**These few simple facts tell the whole story:**

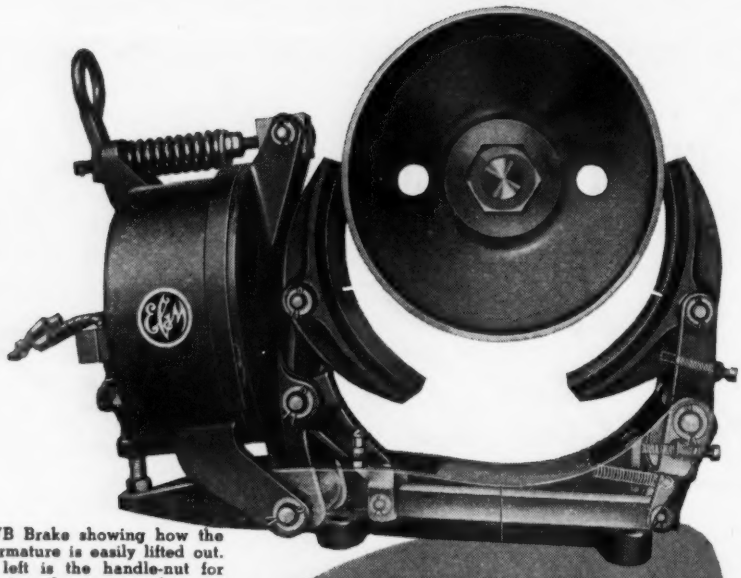
1. A Multi-breaker is the modern circuit wiring protector or "safety valve" for electrical circuits.
2. It automatically disconnects the circuit should a short circuit or dangerous overload occur.
3. Multi-breakers operate without fuses and there is nothing to replace to restore the circuit.
4. A simple movement of the lever restores current after the cause of the short circuit or overload has been removed. There are no delays—no fuss or bother.
5. Multi-breakers meet the 1947 National Electrical Code. They are non-tamperable.
6. On the average, Multi-breakers cost no more—sometimes less.

**The MULTI-BREAKER . . . a logical way to reduce service interruptions, costly service calls and build valuable customer good will.**

*The* MULTI-BREAKER *eliminates fuses completely. It is neat and compact—can be installed in any convenient wall. It provides the protection and convenience which every modern home deserves.*

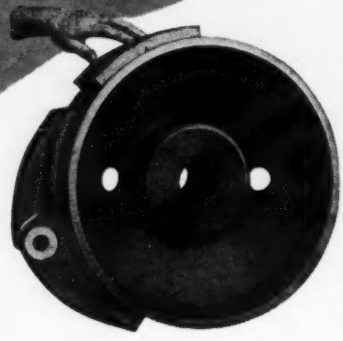
SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES



Type WB Brake showing how the motor armature is easily lifted out. At top left is the handle-nut for compressing the spring when removing motor armature, changing brake shoes and for manual control.

# Long Life Brakes for A-C and D-C Motors by EC&M

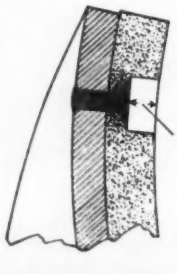


The brake lining is molded to match curvature of wheel and shoe.

These Type WB Brakes for a.c. and d.c. service have a block type lining which is both thick and tough.

Furthermore, due to the process of manufacture, the blocks have proper frictional quality *throughout the entire thickness* permitting uniform and complete wear down to rivet heads. And since the material is non-compressionable, brake adjustments are infrequent.

EC&M Type WB Brakes are built in several sizes. They can be supplied with series or shunt-wound operating coils for direct current motors. On alternating current service, they are supplied in shunt-wound form for use with a compact rectifier-unit. Send for Bulletins 1004 and 1006 describing these long life brakes.



Actual wearing thickness, between rivet heads and brake wheel, is 1/8" on the smallest size to 1/2" on the largest size.

THE ELECTRIC CONTROLLER & MFG. CO.
2698 EAST 79th STREET • CLEVELAND 4, OHIO

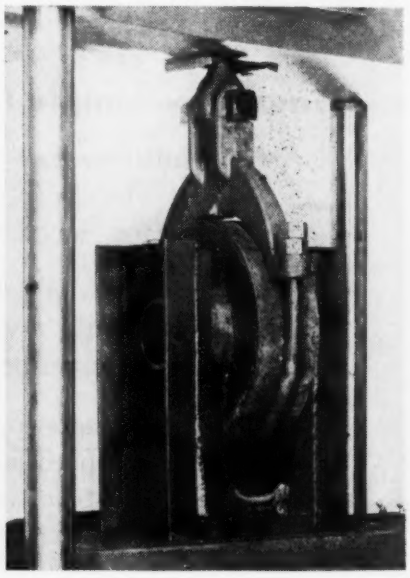

with NEMA dimensions. On the side of each motor there is mounted a cast iron outlet box threaded for conduit.

Every motor is subjected to tests. Average readings on a quantity of 1½-hp, 1,200-rpm, 440-v, 3-phase, 60-cycle motors are: Input 2.6 amp, power factor 67 percent, torque 6.9 ft-lb, speed, 1,160 rpm.

•

## Pipe Clamp

FOR HIGH-TEMPERATURE PIPING, clamps in seven sizes from 4 in. through 16 in. are available from Grinnell Co, Inc, Providence, R. I. A commercial clamp is made of chrome-vanadium steel as a one-piece drop forging and equipped with a U-bolt of the same material. Illustration shows a 14-in. pipe-clamp set up in a tensile testing machine.



These high-temperature clamps are expected to meet the major portion of requirements at temperatures up to 1,000 F. Load ratings are reported to have been established for their use on piping at various elevated temperatures in accordance with the Code for Pressure Piping.

•

## Universal Tester

A NEW vest-pocket size electric tester is available as a continuity tester which operates directly from a 110-v convenience receptacle. It is also adapted to conventional line testing, indicating voltages from 75 to 600 volts, and for detecting ground on appliances. The device has been developed by the Star Fuse Co, 168 Center St, New York, N. Y., and is designed to give only positive indications.

This SureTest Universal tester consists of an insulated sprocket around

# No "HAND-ME-DOWNS" at MOSINEE

**It is the MOSINEE policy to create *custom-made* papers *only* . . . custom-made to fit our *customers' specific requirements.* There are no "stock runs" of general-purpose papers at MOSINEE . . . no "hand-me-downs" or attempts to sell you a standard paper rather than the "made-to-order" type that is essential to the functions you want paper to perform in your products and processing.**

**MOSINEE paper technicians cooperate in determining *what* you need in paper, and *how* you can process it best . . . then MOSINEE makes paper according to *your* needs. MOSINEE has the experience plus scientific and production controls for moisture repellency, specified dielectric strength, high tensile strength, folding, maximum-minimum pH and other vital characteristics of modern industrial papers.**

**That's why many manufacturers rely on MOSINEE as a dependable source for industrial papers.**

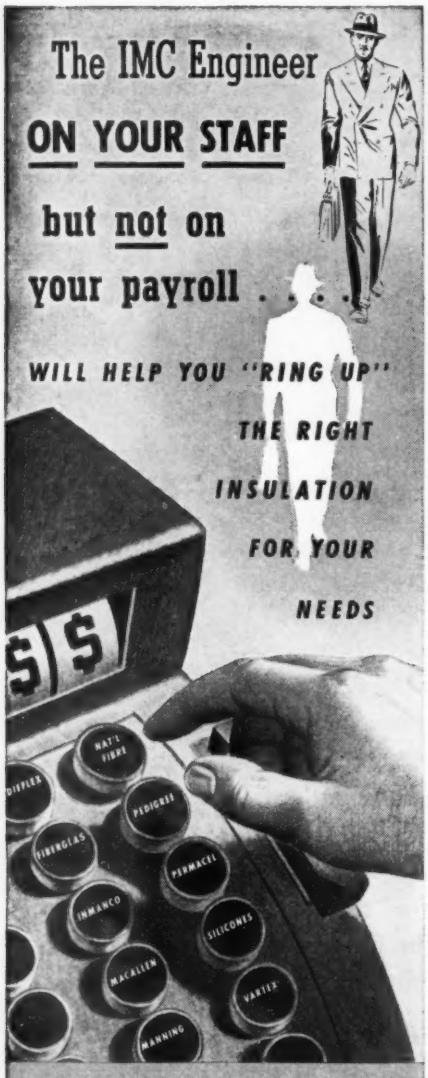
MOSINEE PAPER MILLS CO. MOSINEE, WISCONSIN REG. U.S. PAT. OFF.

**MOSINEE PAPER MILLS COMPANY**

**MOSINEE • WISCONSIN**

*Essential Paper Makers*

*Please address your letter to "Attention Dept. B"*




The IMC Engineer will be glad to show you the right insulation to meet your needs, and he'll probably save you money. You'll improve your products, too, by making them more trouble free and long lasting.

The IMC Engineer will help you because he is especially trained to...

1. Assist you in the selection of the best insulation for your job.
2. Familiarize you with its proper application.
3. Suggest ways to eliminate waste.
4. Help you increase your production.

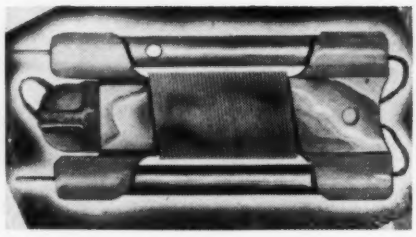
**INSULATION**
**MANUFACTURERS CORPORATION**

ELECTRICAL IMC INSULATION

- CHICAGO 6, 565 West Washington Blvd.
- CLEVELAND 14, 1231 Superior Ave., N. E.

MILWAUKEE 2, 312 East Wisconsin Ave.
DAYTON 2, 1315 Mutual Home Building
DETROIT 2, 11341 Woodward Ave.

REPRESENTATIVES in MINNEAPOLIS 3, 1208 Harmon Pl., and PEORIA 5, 101 Heinz Court.

which is wound 6 ft of test wire. The test cord terminates at one end in a standard base plug, at the other end in two test prods. A neon test lamp is conveniently located in one of the test prods, and is protected by a filtered circuit to eliminate all false indications caused by adjacent live wires, inductance and body capacitance. A high resistance is enclosed in the other test prod to avoid accidental grounds.

The tester weighs 4 oz. When not in use, the test prods are fastened to the frame around which the test wire is wound, and can be conveniently carried in the vest pocket.

•

## Geon Polyblend

A THERMOPLASTIC material designated Geon 500 series polyblend is in production by B. F. Goodrich Chemical Co, 324 Rose Building, Cleveland 15, Ohio. This development is the first in a series of colloidal blends of Geon polyvinyl chloride resin and Hycar nitrile rubber polymers.

Geon polyblend has been designed for extruding and calendering and is adapted to embossing and press-polishing operations. In the electrical industry, polyblend will serve as a covering for cables containing vinyl insulated wires since there is no danger of plasticizer migration, it is reported.

Stock can be processed either on a hot or cold mill where it forms a smooth sheet after only one "pass" and unlike rubber does not require a "breakdown" period. Accompanying table gives some physical properties of a typical Geon polyblend molded 5 min at 345 F.

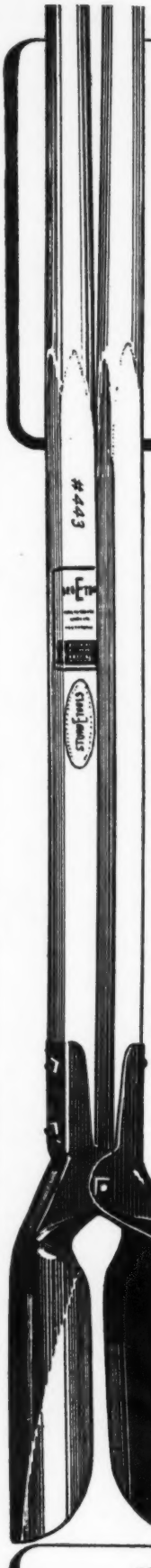
| Property | Value |
|---|---|
| Tensile, psi | 1,850 |
| Elongation, % | 430 |
| 100% Modulus, psi | 1,100 |
| Hardness, Durometer "A" | 94 |
| Crescent Tear, lb/in | 320 |
| Specific Gravity at 77F | 1.23 |
| Freeze—ASTM (5 hr) passed at | —50F |

•

## Slide Rule

CIRCULAR TYPE of slide rule has twelve scales on the face side of the rule, thus permitting direct transfer of reading from one scale to another. Known as the Dualog, the slide rule is obtainable from Tavella Sales Co, 25 West Broadway, New York 7, N. Y.

Solutions can be obtained for prob-


**SPEED**
**post digging**
**with this**
**PERFECTION**
**post hole digger**

This SturdE digger is designed and engineered for speed—built by the strongest known method of construction. Blade and shank are forged from *one solid piece* of high carbon steel, then heat treated. The blade takes and *holds* a keen cutting edge.

Ash handles are square for two to three feet above blade. Then, tapered and rounded to give a firm, hand-fitting grip. The blade is attached to handle by hardened bolts that won't crystallize and shear off.

These special SturdE features give you a Perfection Post Hole Digger that is easy and economical to use. Manufactured by The American Fork and Hoe Company, Cleveland, Ohio, Makers of True Temper Products.

**STURDETOOLS**
*a TRUE TEMPER PRODUCT*

*Tapered blade is 12 in. deep by 7 in. wide, forged from one solid piece of high carbon steel. Made in regular and heavy duty lengths. No seams, no joints, no welds to weaken and fail. Ash handles (7 and 8 ft.) sanded and lacquered, have a 34 in. span when open, carry foot marks to show depth of hole.*

*Distributed by*
**JOSLYN MFG. & SUPPLY COMPANY**
**20 North Wacker Drive • Chicago, Illinois**
*Branches and Warehouses with Complete Stocks in Principal Cities of the United States*

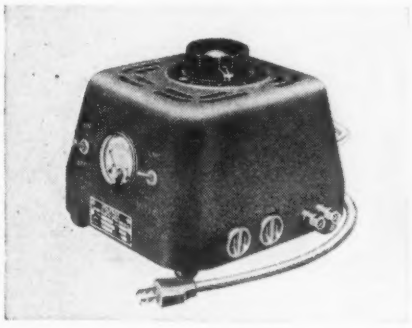
lems involving multiplication, division, proportion, trigonometric functions, logarithms, exponential equations, square and cube roots and powers. Log scales provide means for the direct extraction of any root or power of numbers.

This computing instrument is 9½ in. in diameter and has graduations on white Vinylite. Operation can be learned quickly, it is reported, by anyone who can perform multiplication or division, requiring no knowledge of the underlying principles upon which the slide rule is based.

•

## Voltage Regulator

TWO NEW PORTABLE Voltbox a-c power supply units have been produced by Superior Electric Co, 624 Laurel St,



Bristol, Conn. Both units are alike in appearance but have different ratings. Type UC1M: input, 115 v, 50/60 cycles. single phase; output, 0-135 v, 7.5 amp. 1,000 va. Type UC2M: input, 230 v, 50/60 cycles, single-phase; output, 0-270-v, 3 amp, 810 va.

Contained in the cast aluminum case are a Powerstat variable transformer, a voltmeter, three output receptacles and a set of binding posts, an "on-off" switch and "line-load" switch, renewable fuse, and 6-ft cord with plug.

Rotation of the knob at top of the Voltbox is reported to produce a continuously adustable output voltage from 0 to 17 percent above line voltage at the output receptacles and binding posts. Line and load voltage are read on the voltmeter by operating the "line-load" switch.

A similar base is available for users having Powerstat variable transformers types 116 or 216.

•

## Fused Rotary Switch

SPACE SAVING on switchboard is a feature claimed for a fused rotary snap switch announced by Electro Switch Corp, Weymouth, Mass. The assembly comprises a type P quick-make and quick-break switch in combination with panel mounted fuse holders. Standard


SORGEL
AIR-COOLED
TRANSFORMERS

*A Size and Type for Every Purpose*

**¼ Kva to 333 Kva Single Phase**
**1 Kva to 1000 Kva 3-Phase**

To operate 115 volt lighting and portable equipment from 230-460 or 575 volt power circuit.
To operate special equipment from standard circuits.
To change odd voltages to standard voltages, and phase changing.
For high voltage interior distribution systems with transformers at load centers. Voltages up to 13,200.

***Representatives and Sales Engineers in the Following Principal Cities***

BALTIMORE, MD.
ELMER RICHARDS MFG. AGENCY
P. O. Box 7627 Gwynn Oak Station
4407 Liberty Heights Ave.

BOSTON, MASS.
Jones & Manter
665 Atlantic Ave.

CHICAGO, ILL.
For the city of Chicago and Vicinity
John Smith
8 S. Dearborn St.

For Northern Illinois and Northern Indiana
L. L. Weldy
20 N. Wacker Drive

CINCINNATI, OHIO
C. G. Tarkington
229 E. 6th St.
48 Duffenhofer Bldg.

DES MOINES, IOWA
Midwest Equipment Co.
906 Grand Ave.

DETROIT, MICH.
W. H. Yeomans
2911 W. Grand Blvd.

HOUSTON, TEXAS
Wilson Electrical Equip. Co.
#1 North Sampson

INDIANAPOLIS, IND.
J. E. Nelson
424 Peoples Bank Bldg.

KANSAS CITY, MO.
Fleming & Co.
1207 Grand Ave.

LOUISVILLE, KY.
J. L. Reighart
4617 Duncan

LOS ANGELES, CALIF.
H. D. Easterbrook
1262 S. Boyle Ave.

MINNEAPOLIS, MINN.
S. A. Beaumont
119 S. 3rd St.

NEW YORK, N. Y.
Corte Engineering Co.
Woolworth Bldg.

OMAHA, NEB.
Midwest Equipment Co.
1112 Farnam St.

PITTSBURGH, PA.
Crescent Sales Co.
298 Duquesne Way

PORTLAND, OREGON
J. E. Edstrom
Route 6, Box 1331

ST. LOUIS, MO.
Chas. H. Douglas
26 S. Tenth St.

SEATTLE, WASH.
Fred W. Carlson
307 Wall St.

SALT LAKE CITY, UTAH
A. J. Elggren & Sons Co.
428 S. W. Temple St.

SAN FRANCISCO, CALIF.
Campbell & George Co.
379 Brannan St.

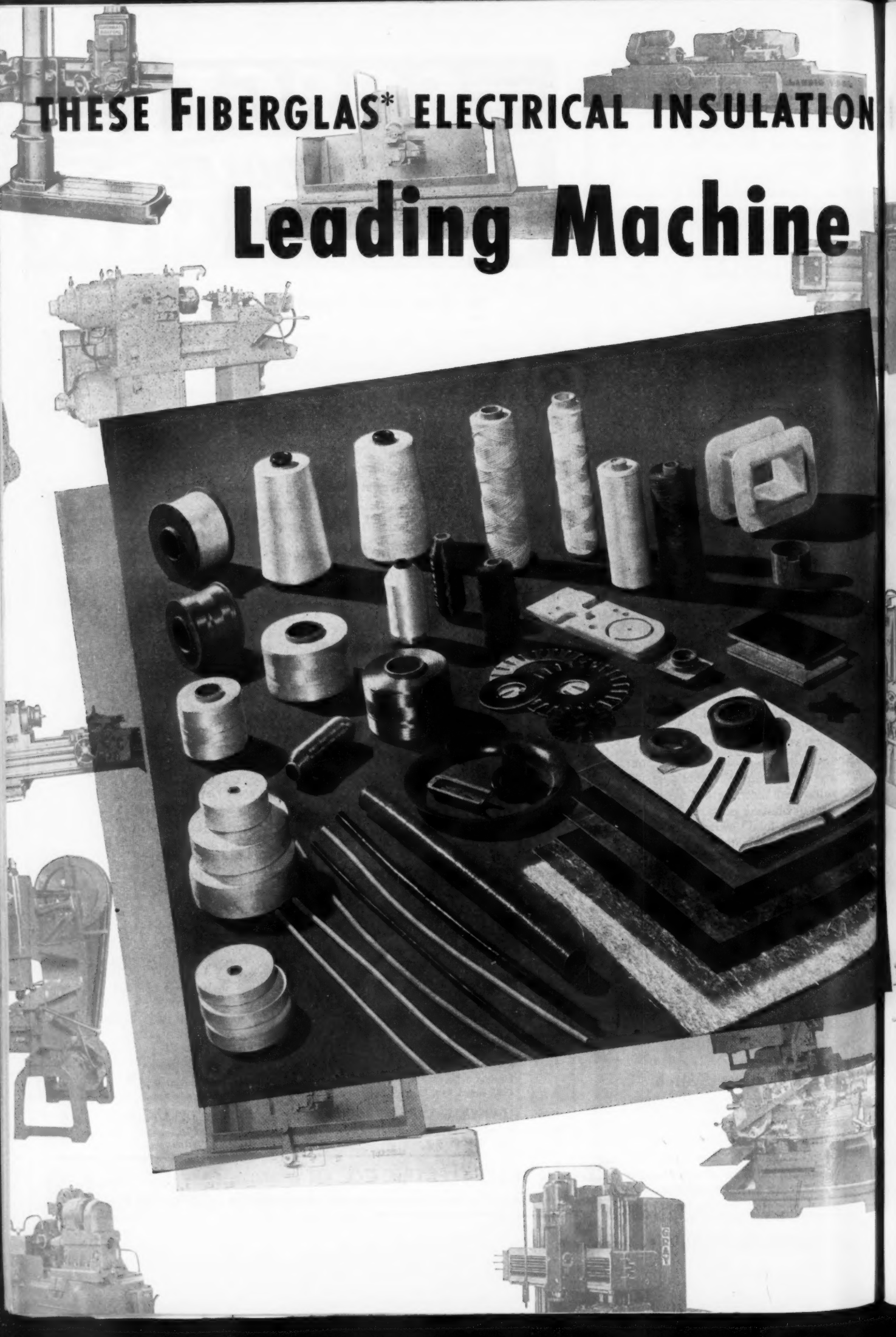
SPOKANE, WASH.
Harrell W. Kanzler
S. 4202 Grand Ave.

TULSA, OKLA.
Paul King Co.
1519 S. Boston

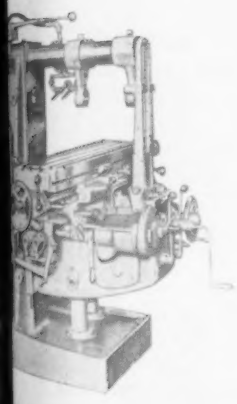
**SORGEL ELECTRIC CO., 834 W. National Ave., Milwaukee 4, Wis.**
***Pioneers in the development and manufacturing of Air-Cooled Transformers***

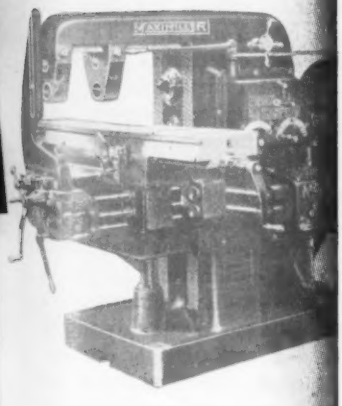
# THESE FIBERGLAS* ELECTRICAL INSULATION

# Leading Machine



# *Advantages* ARE PROVIDED BY Tool Builders





Many machine tool builders are now equipping their machine tools with Fiberglas-insulated motors—motors that assure *extra stamina, longer life* and *lower operating cost.* Fiberglas Electrical Insulating Materials protect motors against the effects of sudden thermal shocks and permit greater variations in winding temperatures. They also help to reduce the number of costly breakdowns caused by oil vapors, metal chips and coolants. In many instances, they have resulted in appreciable increases in the operating efficiency of the machine . . . for instance, one machine tool builder was able to increase greatly the reversal capacity to an extent not possible with other insulating materials. Fiberglas Electrical Insulating Materials offer many new design possibilities such as important savings in weight per horsepower and in over-all floor space.

Write today for your copy of "For Machine Tool Users Only", the new booklet which contains facts about Fiberglas-insulated machine tool motors. Write Owens-Corning Fiberglas Corporation, Dept. 858, Toledo 1, Ohio. Branches in principal cities.

*In Canada: Fiberglas Canada Ltd., Toronto, Ontario.*

OWENS-CORNING

**FIBERGLAS**

ELECTRICAL INSULATING MATERIALS

***Fiberglas is the trademark (Reg. U. S. Pat. Off.) for a variety of products made of or with glass fibers by Owens-Corning Fiberglas Corporation.**

Why leaders in every field use PALNUTS—

ALWAYS HOLD TIGHT
•
EASY AND FAST TO ASSEMBLE
•
LOW IN COST
•
WITHSTAND HIGH TEMPERATURE
•
DO NOT DAMAGE NUT OR NUT SEAT

Used as locknut on heavier assemblies.

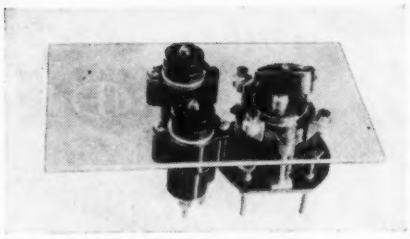
Used alone as self-locking nut on lighter assemblies.

● Send details of your application for recommendation and free samples. Ask for literature describing Palnut double-locking principle, advantages, types, etc.

THE PALNUT COMPANY

51 Cordier St., Irvington 11, N. J.

DOUBLE-LOCKING PALNUTS



cartridge fuses accommodated are in the 10-, 30-, 60-, 100- and 200-amp ratings.

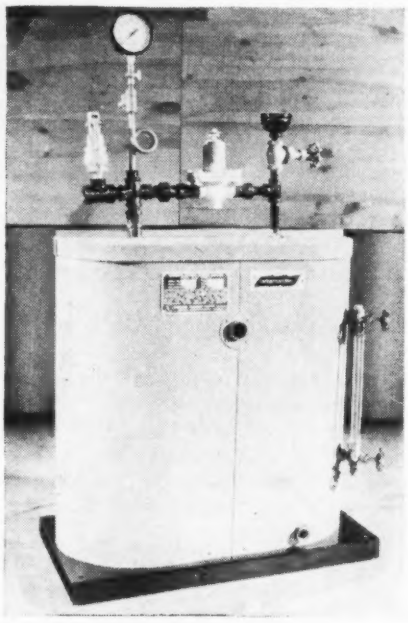
The fuse holder includes a neon-lamp type blown-fuse indicator and provides for replacing fuses from the front of the panel.

•

## Steam Generator

AN ELECTRODE-TYPE electric steam boiler is being produced by Livingstone Engineering Co, 120 Milk St, Boston 9. Mass. The unit is designed to deliver up to 85 lb of steam per hour at pressure up to 500-psi gage and temperatures up to 470 F. Capacity ratings are from 6 kw to 28 kw. The units are for use on a-c circuits only and can be applied to closed or open systems.

The Speedyelectric steam generator has two steel tanks and solid metal electrodes, in one enclosure. Floor space is 16 in. by 30 in. and height is 30¼ in.

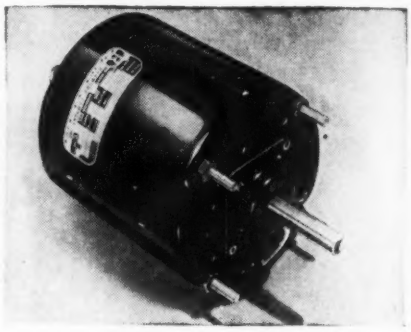


to top of case. Weight is 350 lb. Capacity is approximately 5 gal. Level of electrolyte (water and tri-sodium phosphate) can be maintained by tap to water supply or hand fill. Steam connections are ¾-in. steam outlet, ¾-in. condensate return, and one washout outlet. These balanced control models are reported to automatically regulate steam pressure and temperature with minimum electric input to balance heating load.

## Shaded-Pole Motor

INTRODUCED as an addition to the line of fractional-horsepower electric motors manufactured by Redmond Co, Inc, Owosso, Mich., is a new unit built in sizes up to 1/15 hp for fan duty applications. It is referred to as type "W", is of ventilated 4-pole, shaded-pole design for a-c operation and stated to be non-radio-interfering.

The motor was engineered especially for use on products such as air cir-



culators, window type ventilators, unit coolers, evaporative coolers, exhaust and pedestal fans and air conditioners. The porous bronze bearings are spring tension centered and broadly spaced to provide smooth operation.

The precision-skewed, flush-weld rotor, patented by the maker, is micro-balanced and has a machined surface, rust inhibited.

This 1/15-hp type "W" unit operates at 1,500 rpm on 115 v, 60 cycles. Overall housing length is 5⅛ in. and diameter is 3⅛ in.

•

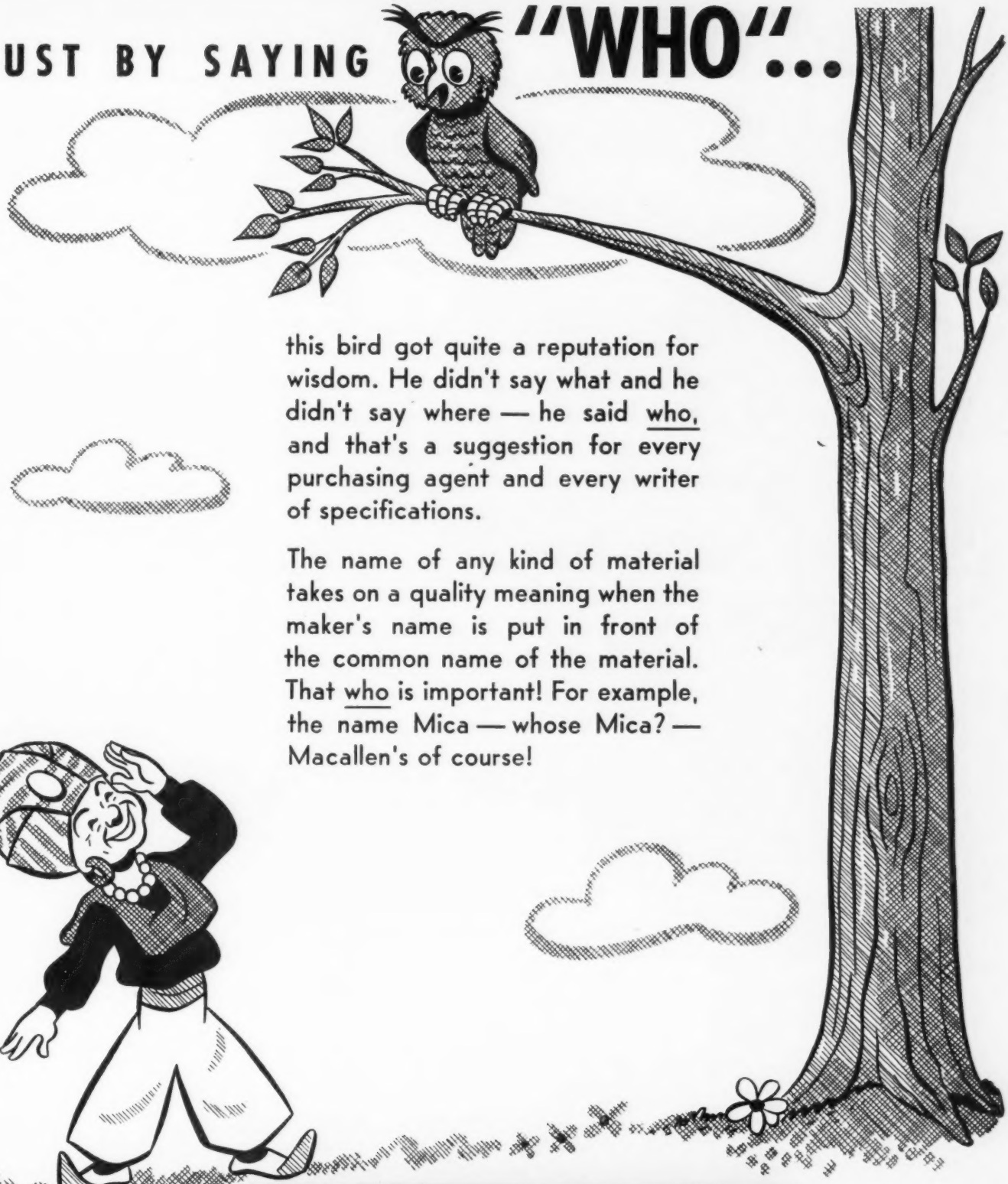
## Analysis Unit

A NEW Geiger-counter fluorescence analysis unit makes possible rapid quantitative metal analysis, according to North American Philips Co, Inc, 100 East 42nd St, New York, N. Y. The new NORELCO unit determines quantitatively the purity of metals or the percentages of alloying components, and quantities of metallic elements dispersed in non-metallic carriers.

Essentially, the fluorescence analysis unit consists of an X-ray generator, a rotating indexing holder for four specimens, a special collimating system, a crystal (usually sodium chloride), a goniometer having a scale graduated from 0 to 90 deg, and a Geiger counter. Crystal and Geiger counter are mounted on and positioned by arms which traverse the goniometer arc.

The apparatus serves for determinations on elements ranging from atomic numbers 20-41 when a rock salt crystal is employed. For elements 42-50, a calcium fluoride crystal may be used.

# JUST BY SAYING "WHO"...



this bird got quite a reputation for wisdom. He didn't say what and he didn't say where — he said who, and that's a suggestion for every purchasing agent and every writer of specifications.

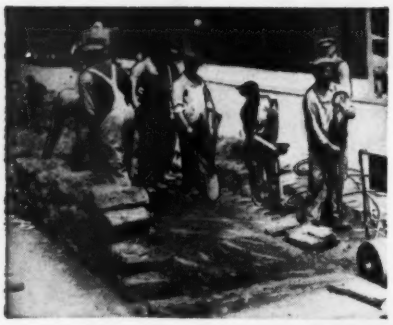
The name of any kind of material takes on a quality meaning when the maker's name is put in front of the common name of the material. That who is important! For example, the name Mica — whose Mica? — Macallen's of course!

## MACALLEN MICA

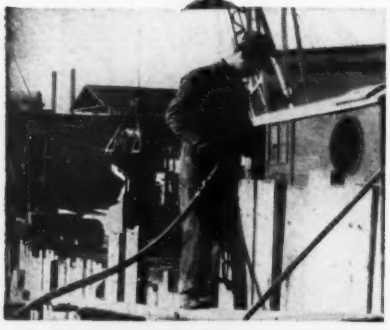
ALL FORMS, ALL QUANTITIES — ALL DEPENDABLE

when you think of MICA, think of MACALLEN

**THE MACALLEN COMPANY** 16 MACALLEN STREET • BOSTON 27, MASS.
CHICAGO: 565 W. WASHINGTON BLVD. • CLEVELAND: 1231 SUPERIOR AVE.



*Utilities use*
**SCHRAMMS**
*on jobs like these*



Four of many uses of Schramm Air Compressors in the Utility field. No matter how tough the job, or where it is, the versatile Schramm is a hard-hitter that furnishes air easily, quickly, economically.

Schramm features. (1) Watercooling 100% (2) Forced Feed Lubrication (3) Mechanical Intake Valve (4) Compact lightweight units, easily moved about.

Today Utilities throughout the country are using Schramm Air Compressors. There's a wide range of Schramms to select from, ranging from 20 to 420 cu. ft. actual air. We invite you to write us today for complete details on our many models.

*Let* **SCHRAMM**
*help you on your compressed air job!*

**SCHRAMM**
**INC.**
**THE COMPRESSOR PEOPLE**
**WEST CHESTER • PENNSYLVANIA**


## TECHNICAL LITERATURE

**Vinylite Compounds**—A 12-page booklet provides technical information on Vinylite Brand plastic wire and cable insulating compounds. It is published by Bakelite Corp, 30 East 42nd St, New York 17, N. Y. Eight series of compounds are discussed with relation to the properties of both standard and made-to-order compounds. Included are tables listing electrical and physical properties of the compounds, also a listing of Underwriters Laboratories' approvals on Vinylite plastic compounds.

**Acid Inhibitors**—Service report entitled "Improved Pickling and Neutralizing with Oakite Materials" is made available by Oakite Products, Inc, 22 Thames St, New York 6, N. Y. The 6-page publication provides data on specialized acid inhibitors and neutralizing materials used in pickling operations on iron and steel.

**Sound Systems**—"Architects Manual of Engineered Sound Systems" is a 288-page publication (8½x11 in.) available from Sound Products Section, Radio Corp of America, Camden, N. J.; price $5 per copy. It is a guide to installation of sound systems in industrial plants, stores, hotels, auditoriums, schools, hospitals, churches, and other institutions. First part defines and discusses the principal components and describes the engineering specifications. Second part is a work-a-day guide on sound systems for the seven principal types of buildings in which sound is most commonly used.

**Photoelectric Cells**—A 12-page brochure on self-generating photoelectric cells has been issued by Selenium Corp of America, 2160 East Imperial Highway, El Segundo, California. The publication contains characteristics, applications, design factors, standard specifications and illustrations of the various shapes and sizes of the barrier type cells with selenium compounds and other metals.

**Rotating Control** — Automatic operation for electrical equipment is outlined in booklet B-3649, entitled "Rotorol", available from Westinghouse Electric Corp, P. O. Box 868, Pittsburgh 30, Pa. Seven pages give data on theory, design and operating principles of Rotorol; remainder of book explains how the equipment regulates voltage, speed, current, power, speed and torque, power factor, and position, and provides stability control and current limiting.

**Coupling Capacitors** — "Standards for Coupling Capacitors and Potential Devices" is Publication 47-123 issued by National Electrical Manufacturers Association, 155 East 44th St, New York 17, N. Y.; price $1. The capacitors described are used to provide capacitance coupling to electric power circuits primarily for carrier-current application and to provide a means of obtaining small amounts of power directly from the circuit without the use of a conventional power or potential transformer. Also covered are coupling capacitor potential devices used to provide a low voltage suitable for operating relays and indicating and recording instruments. Definitions are included for terms used throughout the publication.

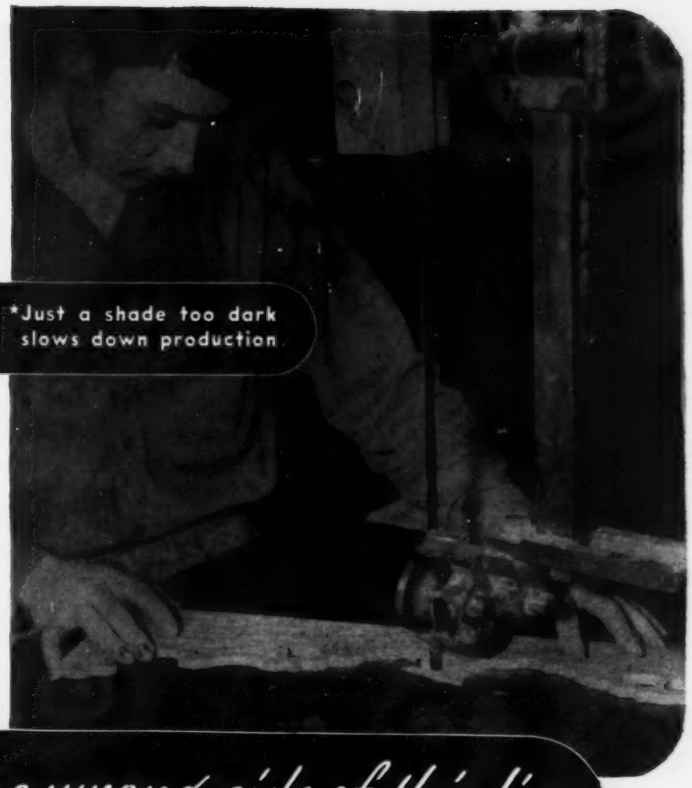
**Air Conditioning**—General principles and techniques of air conditioning as applied to fundamental candy production operations are described in a pamphlet, "Air Conditioning in Candy Manufacture," Refrigerating Engineering Application Data 39, issued by The American Society of Refrigerating Engineers, 40 West 40th St, New York 18, N. Y.; price 20 cents per copy. The 4-page pamphlet contains information on cooling tunnels, cold rooms, hot rooms, revolving coating

# Borderline Vision*

## shades manufacturing profits

● GOOD LIGHTING today is an important production tool. But the difference between good lighting in industry and Borderline Vision — lighting that's just a shade too dim—is often hard to see at a glance.

The best lighting today pays manufacturers dividends in increased, *better* work — better employee morale — and decreased costs. Wheeler engineers have been paying these dividends to industry through Wheeler Skilled Lighting ever since 1881. Wheeler Reflectors give maximum illumination from standard lamps



*Just a shade too dark slows down production.

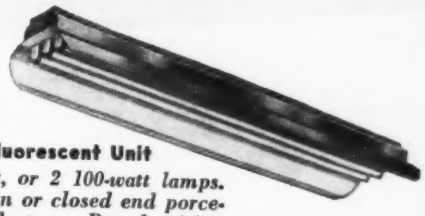
## *Too many plants are on the wrong side of this line*

because they *control* light. Their high reflection factor puts light to work where it belongs—on the job.

The real difference between good lighting and Borderline Vision shows in production figures when Wheeler Skilled Lighting is put to work in a plant. **Wheeler Reflector Co., 275 Congress St., Boston 10, Mass.** Also New York and principal cities.

***Distributed Exclusively Through Electrical Wholesalers***

Just right means more, better work



**All-Steel Fluorescent Unit**
*For 2 or 3 40-watt, or 2 100-watt lamps. Available with open or closed end porcelain enameled reflectors. Broad wiring channel with accessible enclosed ballast. For individual or continuous runs.*

**RLM Solid Neck Incandescent Reflector**

*Maximum lighting efficiency indoors or out. Expertly designed, ruggedly built. Vitreous enamel only. 75 to 1500 watts.*

**Wheeler REFLECTORS**

SKILLED LIGHTING

**MADE BY SPECIALISTS IN LIGHTING EQUIPMENT SINCE 1881**

## —here's how to SAFEGUARD it!

**Apply carbon dioxide with a *Kidde* Portable Extinguisher**

Simple, fast and sure in action, *Kidde* Carbon Dioxide Hand Portables offer an ideal way of extinguishing small fires in auxiliary apparatus—MG sets, capacitors, lightning arresters.

*All* sizes of *Kidde* Hand Portables are equipped with trigger-finger control . . . all work the same quick, natural way. Just aim at the fire and pull the trigger!

Carbon dioxide capacities range from 2½ to 25 pounds. Smaller sizes are especially useful for fighting minor blazes in test labs and meter rooms . . . larger sizes pack plenty of wallop for relatively severe fires.

You'll find it pays to have a few *Kidde* Portables on hand to supplement your built-in carbon dioxide protection systems.

*Remember* . . . carbon dioxide is dry, inert, non-conducting, clean.

Ask a Kidde representative for full information.

**Walter Kidde & Company, Inc., 1230 Main Street, Belleville 9, N. J.**

*The word "Kidde" and the Kidde seal are trade-marks of Walter Kidde & Company, Inc.*

kettles, miscellaneous operations, and methods of supplying refrigeration.

**Fittings**—"Standards for Conduit Fittings, Cable Fittings and Accessories" is Publication 47-125 issued by National Electrical Manufacturers Association, 155 East 44th St, New York 17, N. Y.; price 60 cents. This standard covers fittings and accessories for rigid conduit, flexible metallic conduit, electrical metallic tubing, service entrance cable, armored cable and non-metallic sheathed cable. Accessories such as bar hangers, assemblies, bending tools, cable straps and electrical metallic tubing straps are also included. This standard supersedes Publication 42-80.

**Flexible Cords** — "Standards for Single- and Multiple-Conductor Flexible Cords with Vulcanized Synthetic Insulation and Lead- or Mold-Cured Synthetic Jacket" is the title of Publication 47-124 issued by National Electrical Manufacturers Association, 155 East 44th St, New York 17, N. Y.; price 50 cents. This standard covers cords with conductors sizes No. 18 to 10 AWG inclusive. Two thicknesses of jackets are specified and type letter designations are given.

**Motors**—NEMA Standards for Small-Power Motors, Publication 47-121, is available from National Electrical Manufacturers Association, 155 East 44th St, New York 17, N. Y.; price $2. This new publication includes all standards for small-power motors which have been developed by NEMA up to August 1, and consists of excerpts from the NEMA Motor and Generator Standards, Publication 45-102. It provides practical information concerning construction, test, performance and manufacturing of universal and a-c and d-c small-power motors, as well as standards for special applications.

**ASTM Index**—An "Index to ASTM Standards," as of December, 1946, is available without charge on written request to American Society for Testing Materials, 1916 Race St, Philadelphia 3, Pa. This 242-page publication provides a ready reference to some 1,400 items in the 1946 Book of Standards. Items in the Index are listed under key-words according to subjects. In addition a list is given of specifications and tests in numerical sequence of their serial designations.

**Light Calculator**—The Champion Lightrule is a form of slide rule developed as an aid to anyone concerned with effective lighting installations. A Lightrule will be sent with the compliments of Champion Lamp Works, Lynn, Mass., when request is made on your company's letterhead. A single setting of the slide rule gives the user foot-candles and lumens required per lamp or fixture, or area per lamp or fixture. Reverse side contains a table for determination of Room Indexes.

**Motor Coil Chart**—A Concentric Coil Winding Chart (size 14½x22 in.) for use in making single-phase motor coils has been designed by and is available from Continental Electric Co, 650 North Prairie Ave, Hawthorne, Calif.; price $2.50. Knowing the air-gap diameter of the stator and referring to the tables (for either 24- or 36-slot stators), correct sizes for the various coils in the group are found, both for the starting and the running winding.

**Computer**—Made in the form of a slide rule, a newly created computer can be used for early material planning and testing procedures, giving breaking strength read opposite the psi. It covers rectangular specimens from 1/32 to ¼ in. thick by ½ to 1½ in. wide, from 0 to 150,000 psi; the reverse side covers round specimens from 1/16 to 1 in. dia. up to 100,000 psi. Engineers submitting their full name, company and position, likewise professors in colleges and high schools, may obtain free computers by addressing W. C. Dillon & Co, Inc, 5410 West Harrison St, Chicago 44, Ill.

# CATALOGS and BULLETINS

A monthly digest of recent manufacturers' literature compiled by Electrical World for your convenience in securing without obligation the most recent information on electrical and allied products.

## CHECK ON COUPON BULLETINS DESIRED AND MAIL TO US. WE WILL FORWARD REQUESTS TO MANUFACTURERS

**1** SUPERVISORY SYSTEMS: A catalog, entitled "Power Plant Supervisory Systems," describes the Autocall printing record which keeps a log of all station operations from the inception of trouble to the restoration of normalcy. It is applicable to both connected and isolated plants. Autocall Co.

**2** GEIGER COUNTER: Folder R-1050 entitled "Geiger-Mueller Counters Applied to Mining" explains Geiger counter theory and gives details of construction and operation. Techniques with isotopes, use in pitchblande exploration, oil well logging and geological surveys are treated. North American Philips Co, Inc.

**3** LIGHTING: The Lighting Guide, an 8-page, 8½x11 in. booklet, presents in usable form, certain technical data to supply free advisory service for lighting and decorative needs throughout the home. Lightolier, Inc.

**4** ELECTRIC GOVERNOR: Publication GEA-4764 gives details of an electric governor to provide control over a wide speed range of industrial steam turbines. Illustrations and schematic diagram of governing system is included. General Electric Co.

**5** VOLTAGE CONTROL: An illustrated 12-page bulletin on voltage control provides connection arrangements, performance and engineering data for Powerstat variable transformers and Stabiline automatic voltage regulators. Superior Electric Co.

**6** TRANSFORMERS: Booklet 1147 details technical data on new line of wound-core distribution transformers in sizes up to 25 kva, voltages to 14,400. The 8-page publication describes individually lapped core laminations, recessed stud-type bushings and hinged insulating covers for high-voltage connections. Mechanical data, weights and dimensions, are included. Pennsylvania Transformer Co.

**7** LIGHTS: Bulletin 147-G lists installation data for average room dimensions and germicidal lamp sizes, and illustrates suggested applications. Bright Light Reflector Co.

**8** RELAYS: Brochure gives operating characteristics, descriptions and illustrations of leaf-type relays. American Relay & Controls, Inc.

**9** SPACE HEATERS: A 36-page pocket-size booklet, "A Guide to Quick Heating," is a primer on heating as well as a sales manual. Drawings and diagrams illustrate how heat is produced and transferred to the area of use by six types of heaters, i.e., radiant, reflector bowl, black heat with fan, radiant with fan, case, and steam radiator. Markel Electric Products, Inc, and La Salle Lighting Products, Inc.

**10** PHOTOELECTRIC CELLS: A 12-page brochure includes characteristics, applications, design factors, standard specifications and illustrations of various shapes and sizes of self-generating photoelectric cells. Selenium Corp of America.

**11** SYNCHRONIZER: Bulletin SN-400 provides information on application, operation and installation of an electronic synchronizer to automatically control circuit breaker closure of a-c generators in paralleling to a common bus. Burlington Instrument Co.

**12** ELECTROSTATIC PAINTING: A 16-page booklet explains the principles of electrostatic spray and how the electrostatic coating zone creates a "wrap-around" and causes an even flow of atomized paint particles to exposed exterior contours. Harper J. Ransburg Co.

**13** MAGNETIC FILTER: Bulletin 120-B describes open and closed types with capacity and other specifications on magnetic screen filter separator for removal of iron or steel particles from liquids. Stearns Magnetic Mfg Co.

**14** COMBUSTION CONTROL: Bulletin 1022 discusses and illustrates systems of combustion control for spreader stoker-fired boilers. Bailey Meter Co.

**15** STATION-TYPE CUBICLES: Publication GEA-3658A presents operating curves, air flow charts, diagrams and descriptions of cubicles with air blast breakers for power station service up to 34.5 kv and 2,500,000 kva. General Electric Co.

**16** STREET LIGHT CONTROL: Description and operation of an improved Lamplighter, also connections for controlling multiple street light circuits, are contained in Bulletin 108. W. N. Matthews Corp.

*Circle numbers, sign and mail* — *Coupon good until February 1, 1948*

ELECTRICAL WORLD — *December 6, 1947*
330 West 42nd Street, New York 18, N. Y.

*Please send me, without obligation, manufacturers' literature herein described and identified by numbers circled below:*

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

*This coupon, properly filled in, is referred to the manufacturers for handling. Electrical World serves as a clearing house for this service.*

NAME ..... TITLE .....

COMPANY .....

ADDRESS .....

CITY ..... STATE .....

# NEWS ABOUT PEOPLE

## Moloney Electric Elects J. J. Mullen, Jr, President

James J. Mullen, Jr, executive vice-president of the Moloney Electric Co, St. Louis, Mo., has recently been named company president succeeding the late James J. Mullen, Sr. He became affiliated with the Moloney company in 1933 as secretary. Three years later he was made executive vice-president, expending most of his energies in sales and sales promotion.

Mr Mullen has traveled extensively in the interest of the company and has made a careful study of the nation's utility properties and kept abreast of their requirements. He has been active in industry affairs. At one time he served as chairman and is still a member of the National Electrical Manufacturers Association's committee on

J. J. MULLEN, JR

apparatus standards. He also is serving on the joint EEI-NEMA standards advisory committee.

Mr Mullen was graduated from St. Louis University in 1931 and Harvard Business School in 1933. Directly following, he entered Moloney Electric.

•

► ALBERT C. RICKBORN, formerly power plant superintendent of the Derby Gas & Electric Co, Derby, Conn., has recently joined the Mississippi Power & Light Co as plant superintendent of the new Rex Brown steam electric generating station now under construction in North Jackson. Mr Rickborn has been connected with Derby Gas since 1941.

C. F. JOHN

## John Made Vice-President In Charge of Power

Carl F. John has been elected vice-president of the Wisconsin Electric Power Co, Milwaukee, in charge of power. Formerly an assistant vice-president, Mr John succeeds George G. Post, who retired in September after 41 years of service with the company.

Following graduation from Cornell University, Mr John was employed in a manufacturing business in Milwaukee for four years. He joined the power division of Wisconsin Electric Power in 1926 as assistant engineer, became assistant to vice-president in 1932 and an assistant vice-president of the company in 1946.

From 1941 to 1945 he served as consultant to the Office of Production Management and later the War Production Board on the work of allocating steam generating equipment.

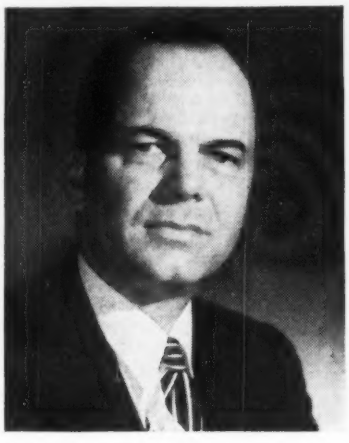
In the course of his career, Mr Post became a widely known authority in the electrical industry on power plant and electric distribution problems. He served on a number of regional and national committees studying technical problems. He entered the employ of the Milwaukee Electric Railway & Light Co, predecessor of Wisconsin Electric Power, in 1906 as assistant to the electrical engineer of the lighting department. He served as superintendent of electrical testing and electrical engineer in charge of the electric distribution department before his appointment as vice-president in charge of power in 1929.

## F. V. Armistead to Form Consulting Organization

Frederick V. Armistead, industrial sales manager of the Union Electric Co of Missouri, St. Louis, has resigned his position with that company effective the end of the year, for the purpose of establishing his own consulting engineering organization.

Mr Armistead has been with Union Electric for the past 19 years. Prior to going to St. Louis and subsequent to his graduation in 1918 from the Virginia Military Institute, he was with the General Electric Co in Mexico. He has successively held the positions with Union Electric of industrial engineer, development engineer, chief industrial engineer and industrial sales manager.

The new firm which Mr Armistead is founding will have its offices at 1259 North Kingshighway Boulevard, St. Louis, and will be known as industrial and municipal consultants, specializing

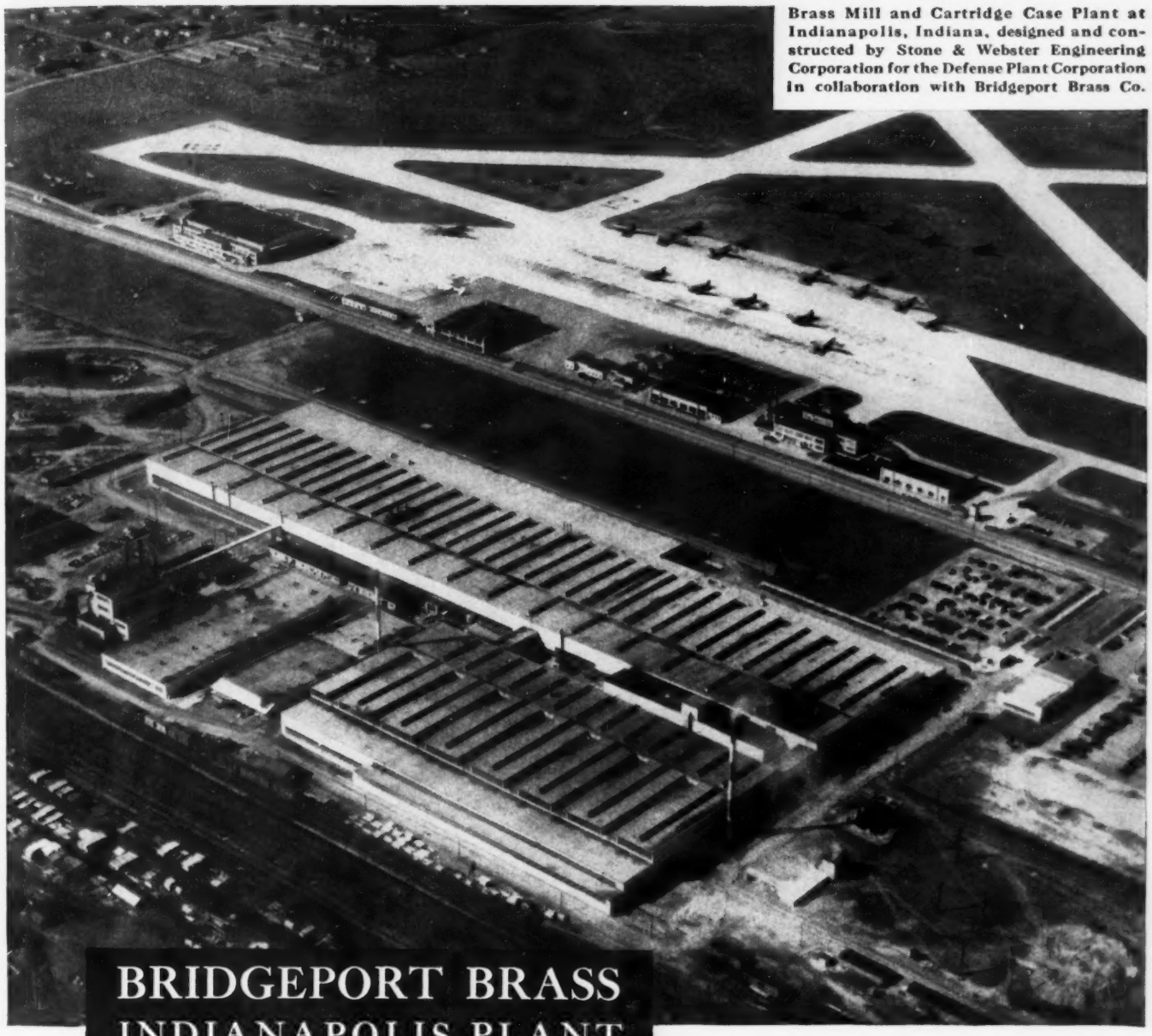


F. V. ARMISTEAD

in all phases of electric power and process heating applications. Included in the fields of endeavor are such items as general engineering supervision, power plant studies, analysis of purchased power costs, power and heating applications, power cost accounting and methods analysis.

•

► CHESTER B. EATON has been appointed director of sales promotion and merchandising for the Central Vermont Public Service Corp with headquarters at Rutland. He succeeds the late A. H.



Brass Mill and Cartridge Case Plant at Indianapolis, Indiana, designed and constructed by Stone & Webster Engineering Corporation for the Defense Plant Corporation in collaboration with Bridgeport Brass Co.

# BRIDGEPORT BRASS
## INDIANAPOLIS PLANT

**IN designing and constructing the Brass Mill and Cartridge Case Plant at Indianapolis, Stone & Webster Engineering Corporation collaborated with Bridgeport Brass Company engineers . . . Provision had to be made for the immediate and variable needs of wartime production . . . During the war it proved to be one of the lowest cost producers of cartridge brass in the country.**

**Today this efficient plant is again in operation as Bridgeport's mid-western brass mill. The shifting demands of peacetime production were met with a minimum of changes. It stands as an example of sound engineering . . . planned for future needs.**

## STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY OF STONE & WEBSTER INC.

BAXCO

LONG LIFE

DOUGLAS FIR POLES

Our specialty is long-length Douglas Fir poles, pressure treated for Long-Life service. Prompt shipments of reasonable quantities can now be made in most lengths from 60 foot to 125 foot. Direct rail shipments out of our treating plant stocks can be made to any point in the United States. Write or wire us your inquiries.

Pressure treated Douglas Fir poles have been for years the standard in pole line construction on the West Coast. BAXCO Long-Life Douglas Fir poles meet ASA Specifications and are pressure treated with coal-tar creosote or creosote-pentachlorphenol solution by the empty cell process, 8-lb. retention, in accordance with AWPA Specifications.

BAXCO Long-Life Douglas Fir poles, pressure treated from high quality Coast-type timber, will cut your maintenance costs and yield longer and more satisfactory service.

*Also Produced by* J. H. Baxter & Co. of Oregon—*an associated company*
Plant and Yard—Eugene, Oregon

J. H. Baxter & Co.

333 MONTGOMERY STREET · SAN FRANCISCO 4, CALIFORNIA
LOS ANGELES · LONG BEACH · ALAMEDA · CALIFORNIA, U. S. A.

Allcott, former merchandising manager. Mr Eaton joined the company in 1946, following about four years in the U. S. Army. He was named director of sales promotion and publicity at that time.

•

## Burndy Engineering Names DeMarsh Sales Manager

Eric E. DeMarsh has been appointed sales manager for Burndy Engineering Co, Inc, New York and Vernon, Calif. Mr DeMarsh joined Burndy in 1936 as

E. E. DeMarsh

chief field engineer. Three years later he was made assistant director of company sales, domestic and foreign. Recently he was elected to the board of directors.

An electrical engineering alumnus of Rensselaer Polytechnic Institute, Mr DeMarsh's broad experience in the electrical industry was obtained in part from his earlier association with utility operating and construction companies, chief of which were the Consolidated Edison Co and J. O. Oliver & Co, contractors. He also served with a government unit under the supervision of Leon Henderson.

•

► J. H. Clawson has been elected treasurer of the Puget Sound Power & Light Co, Seattle, to succeed Fred W. Brownell who has resigned after 41 years of outstanding service in the public utility industry. The retirement of Mr Brownell, due to reasons of health, after 28 years of service with Puget Power, was marked with sincere regret by the board of directors of the company. He had a remarkable career in the accounting phases of the public utility business, with the Hudson River Water Power Co, Adirondack Electric Power Corp and the Connecticut Power Co, before joining the Puget Sound organization. For many years he was active in the Northwest Electric Light

Runner for 35,000-hp. capacity Pelton (impulse) type turbine for Southern California Edison Company, head 2200 feet.

FROM THE LARGEST to the smallest

Baldwin offers:

97 years' experience in the design and manufacture of hydraulic turbines.

The complete turbine line includes a type and size to satisfy any head condition and any output requirement.

May we tell you how our experience and facilities can help you?

# BALDWIN
# hydraulic turbines
## for every type of power development

BLW THE BALDWIN GROUP

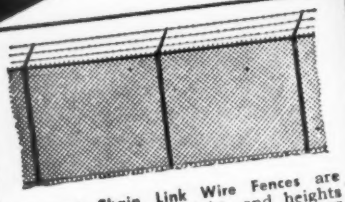
**BALDWIN**

The Baldwin Locomotive Works, Philadelphia 42, Pa., U. S. A.
The Pelton Water Wheel Co., San Francisco 10, Calif., U. S. A.

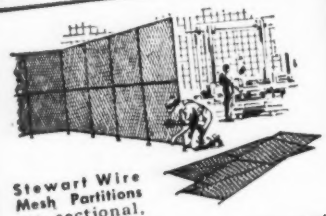
Offices: Birmingham, Boston, Chicago, Cleveland, Houston, New York, Philadelphia, Pittsburgh, Seattle, St. Louis, Washington.

STEWART FENCES
AND
METAL SPECIALTIES

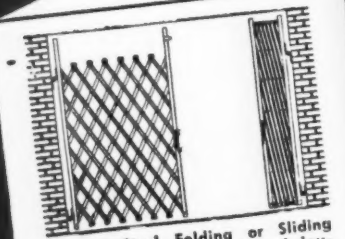
Stewart Wire and Iron Products include many items which are used extensivcly in the electrical field. Three are illustrated. Others are Iron Picket Fences and Gates; Wire and Iron Window Guards; Machinery Guards; Pipe Railings; All Steel Settees, etc.



Stewart Chain Link Wire Fences are made in several weights and heights to meet all requirements. Style 3TH is shown above. Also made in style 5TH (5 strands of barbed wire) and 0TH, without barbed wire overhang.



Stewart Wire Mesh Partitions are sectional, and made to fit any space. Give all measurements when writing for information.



Stewart Steel Folding or Sliding Gates are made in single and double construction to fit any opening.

Literature sent on request. When writing please mention products in which you are especially interested.

The Stewart Iron Works Co., Inc.
1466 Stewart Block Cincinnati 1, Ohio
*Experts in Metal Fabrications Since 1886*

Stewart IRON and WIRE FENCES


and Power Association and was chairman of its accounting section in 1928. Mr Clawson joined Puget Sound Power & Light in 1933 in the capacity of auditor. Subsequently he held the position of assistant treasurer from 1936 until 1946 when he was appointed controller. He is a member of the Washington Society of Certified Public Accountants and is active in the accounting section of the Northwest Electric Light & Power Association. He is also a member of the National Association of Cost Accountants.

•

## Stone & Webster Elects Two New Vice-Presidents

Edward C. Brewster and Philip B. Scott have been elected vice-presidents of Stone & Webster, Inc.

Mr Brewster was associated with the New York Trust Co for several years and entered the employ of Stone & Webster, Inc, in 1941. He left the company in 1942 to enter the Naval Reserve and following his release rejoined Stone & Webster in 1946.

Mr Scott was a vice-president and director of General Public Service, Inc, prior to entering the armed forces, and upon release from military service in 1946 became associated with Stone & Webster.

•

▶ PAUL A. ESCHOLZ has been appointed superintendent of the meter department, Hartford Electric Light Co. He succeeds the late E. Y. Rice. Mr. Escholz was graduated from Rensselaer Polytechnic Institute in 1926. He taught there until 1934, when he joined the Hartford utility as a meter department clerk. He was promoted to assistant superintendent in 1946. OMER H. NORTON, supervisor of the company's standardization laboratory since 1926, has been appointed assistant superintendent of the meter department. He is a Rensselaer graduate of 1920, and was employed at the company's Dutch Point and South Meadow stations in various capacities before being transferred to the standardization laboratory.

▶ J. SCHUYLER CASEY, president of the M. H. Treadwell Co, Inc, New York, was elected president of the United Engineering Trustees, Inc, at the annual meeting held recently in New York. He succeeds J. P. H. PERRY, vice-president of the Turner Construction Co, who served as president of United Engineering Trustees from 1945 to 1947. Mr. Casey is also president of the Treadwell Construction Co, Midland, Pa., and chairman of the board


SUPERIOR

SINCE 1923

The name SUPERIOR has stood for top quality meter testing and installation equipment — built specially for the

UTILITY INDUSTRY

SUPERIOR SWITCHBOARD & DEVICES CO.
CANTON 1, OHIO
A subsidiary of The Union Metal Manufacturing Co.

# VALUABLE EASY-TO-BUY ELECTRONICS

large stocks...

wide selection...

quick delivery, too!

## Authorized WAA Electronics Distributors

### EASTERN

Automatic Radio Mfg. Co., Inc.
122 Brookline Ave.
Boston, Mass.

Carr Industries, Inc.
1269 Atlantic Ave.
Brooklyn, New York, N. Y.

Tobe Deutschmann Corp.
863 Washington Street
Canton, Mass.

Electronic Corp. of America
353 West 48th Street
New York, N. Y.

Emerson Radio & Phonograph Corp.
76 Ninth Ave.
New York, N. Y.

General Electric Co.
Bldg. 267; 1 River Road
Schenectady, N. Y.

General Electronics, Inc.
101 Hazel Street
Paterson, N. J.

Hammarlund Mfg. Co., Inc.
460 West 34th Street
New York, N. Y.

Hytron Radio & Electronics Corp.
76 LaFayette Street
Salem, Mass.

Johanns & Keegan Co., Inc.
62 Pearl St.
New York, N. Y.

Newark Electric Co., Inc.
242 West 55th St.
New York, N. Y.

Radio Parts Distributing Co.
128 West Olney Road
Norfolk, Va.

Smith-Meeker Engineering Co.
125 Barclay Street
New York, N. Y.

Standard Arcturus Corp.
99 Sussex Ave.
Newark, New Jersey

Sylvania Electric Products, Inc.
Emporium, Pa.

Technical Apparatus Co.
165 Washington St.
Boston, Mass.

Tung-Sol Lamp Works, Inc.
95 Eighth Ave.
Newark, New Jersey

W. & H. Aviation Corp.
Municipal Airport
Rochester, New York

### MIDWESTERN

American Condenser Co.
4410 N. Ravenswood Ave.
Chicago, Ill.

Belmont Radio Corp.
3633 S. Racine Ave.
Chicago, Ill.

Electro-Voice, Inc.
Carroll & Cecil Streets
Buchanan, Michigan

E. F. Johnson Co.
206 Second Ave., S. W.
Waseca, Minnesota

### SOUTHERN

Navigation Instrument Co., Inc.
P. O. Box 7001, Heights Station
Houston, Texas

Southern Electronic Co.
611 Baronne St.
New Orleans, La.

### PACIFIC

Cole Instrument Co.
1320 S. Grand Avenue
Los Angeles, Calif.

Hoffman Radio Corp.
3761 S. Hill Street
Los Angeles, Calif.

## MANUFACTURERS
## WHOLESALERS — JOBBERS

See these WAA Authorized Distributors for *your* share! Their inventories include many types of unused electronic devices, tubes and equipment.

Purchasing of surplus electronic tubes, devices and equipment has been simplified to a high degree. These WAA Approved Distributors were selected on a basis of their ability to serve you intelligently and efficiently.

Write, phone or visit your nearest Approved Distributor for information concerning inventories, prices and delivery arrangements. Fill your needs—NOW—while inventories still permit large purchases and wide selection. You'll find you can "Save with Surplus."

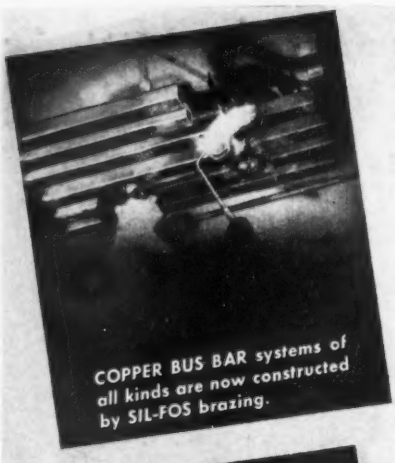
OFFICE OF AIRCRAFT AND ELECTRONICS DISPOSAL

**WAR ASSETS ADMINISTRATION**

Offices located at: Atlanta • Birmingham • Boston • Charlotte Chicago • Cincinnati • Cleveland • Denver • Detroit • Grand Prairie, Tex. • Helena • Houston • Jacksonville • Kansas City, Mo. • Little Rock Los Angeles • Louisville • Minneapolis • Nashville • New Orleans • New York • Omaha • Philadelphia • Portland, Ore. • Richmond • St. Louis Salt Lake City • San Antonio • San Francisco • Seattle • Spokane • Tulsa

1377

**Customer Service Centers in these and many other cities.**



COPPER BUS BAR systems of all kinds are now constructed by SIL-FOS brazing.

SWITCH JAW assembly fabricated by EASY-FLO brazing.

**BETTER-FASTER METAL JOINING IN ELECTRICAL WORK WITH SIL-FOS AND EASY-FLO**

***BETTER***—because these two low-temperature silver brazing alloys, provide every property essential to both electrical and structural joints—*high conductivity — high strength — ductility* equal to the parent metals—*corrosion resistance — low working temperature,* specially desirable when joining thin sections.

***FASTER***—because of the low working temperatures of SIL-FOS and EASY-FLO and their exceptionally free-flowing property—factors which also speed production and bring metal joining costs way down.

***GET FULL DETAILS IN BULLETINS 12-A AND 15***

***Write for them today.***

**HANDY & HARMAN**
82 FULTON ST., NEW YORK 7, N. Y.
Bridgeport, Conn. • Chicago, Ill. • Los Angeles, Cal. • Providence, R. I. • Toronto, Canada
Agents in Principal Cities


of directors of the Treadwell Engineering Co, Easton, Pa. He is a member of the American Society of Mechanical Engineers.

•

## Triangle Conduit Elects Two New Vice-Presidents

Announcement has been made by the Triangle Conduit & Cable Co, Inc, New Brunswick, N. J., of the election of two vice-presidents.

J. G. Slater, formerly treasurer, becomes vice-president and treasurer, and C. V. McKay, formerly assistant to the president, becomes a vice-president.

•

## Yale Honors Two G-E Men at Centennial Celebration

Two General Electric men, Dr Albert W. Hull, assistant director of the company's research laboratory, and Dr Richard W. Porter, special project engineer in the marine and aeronautics engineering division, were among 13 scientists who received honorary degrees from Yale University recently. These were conferred in connection with the celebration of the centennial of Yale's Sheffield Scientific School at New Haven, Conn. Dr Porter and Dr Hull were awarded the degree of doctor of science.

•

► Frank M. Oglee has been appointed manager of employee relations, Trumbull Electric Mfg Co, Plainville, Conn., and J. Warren Barry has been made manager of the company's California operations. Mr Oglee's appointment is in line with a company program to expand its present operations in the field of employee relations, to formulate employee relations policies and to direct and coordinate the personnel activities at all company locations. H. T. Powers will continue in his present assignment as personnel manager of the Plainville plant. Mr Oglee has 20 years of service with the Trumbull organization. As manager of the company's California operations, Mr Barry will be responsible for all activities of the North Hollywood and San Francisco plants, including the responsibility for commercial operations. He has a broad background of experience with the Trumbull organization, having started as a factory hand in the company's old Los Angeles plant in 1928.

► R. H. Newton has been appointed to a newly created office of manager of dealer sales for the Lincoln Electric Co, Cleveland, Ohio. Expanded use of

Listed by Underwriters Laboratories, Inc., and Factory Mutual Laboratories.

**WHERE HAZARDS ARE GREAT**

Wherever an industry requires the storage or handling of materials capable of bursting instantaneously into an intense and devastating fire, the utmost in fire protection is none too good.

Blaw-Knox Aquatomic Fog Nozzles stop "bad fires" at the start.

These dependable non-clogging and hard hitting Fog Nozzles cool and quench sudden fires in mere seconds.

Install Aquatomic Fog Nozzles where the hazard is the greatest for 100% dependable protection.

*Also—*

Blaw-Knox offers Standard Wet and Dry Pipe Systems, as well as Thermostatically Controlled Pre-Action and Deluge Systems.

Write for details.

**BLAW-KNOX**
**SPRINKLER DIVISION**
824 Beaver Avenue, N.S., Pittsburgh 12, Penna.

welding in the small manufacturing, service industry and agricultural fields has brought about the formation of the new office. Mr Newton has been brought to Cleveland from Indianapolis, Minn., where he was district sales manager. He has been associated with Lincoln Electric for 17 years.

## OBITUARY

### Cummings C. Chesney

Cummings C. Chesney, one of the pioneers in long-distance transmission of electric power and for many years an executive of the General Electric Co, died in Pittsfield, Mass., on Nov. 27 at the age of 84.

In the late '80's Mr Chesney became associated with William Stanley, then rising to fame as the man who developed the a-c transformer into a practical device, ushering in a great advance in electrical development. In 1891 he with Mr Stanley and John F. Kelly established the Stanley Electric Manufacturing Co at Pittsfield where they did such pioneer work in a-c engineering that they became famous as the SKC trio.

Mr Chesney was born in Selingsgrove, Pa., was graduated from Pennsylvania State College and after a short teaching experience joined Mr Stanley's laboratory force at Great Barrington, Mass., where he devoted himself particularly to experimental chemistry and electrodynamics. The Stanley Electric Manufacturing Co, which was organized to develop the patents in the a-c field of Messrs Chesney, Stanley and Kelly, was unusually successful. Mr Chesney was vice-president and chief engineer from 1904 to 1906 and on the latter date he took up the duties of chief engineer and manager of the Pittsfield Works of the General Electric Co, which had acquired the Stanley organization. In 1927 he was appointed a vice-president with headquarters at Schenectady and made chairman of the company's manufacturing committee, heading all manufacturing operations of the organization. At the time of his death he was honorary vice-president.

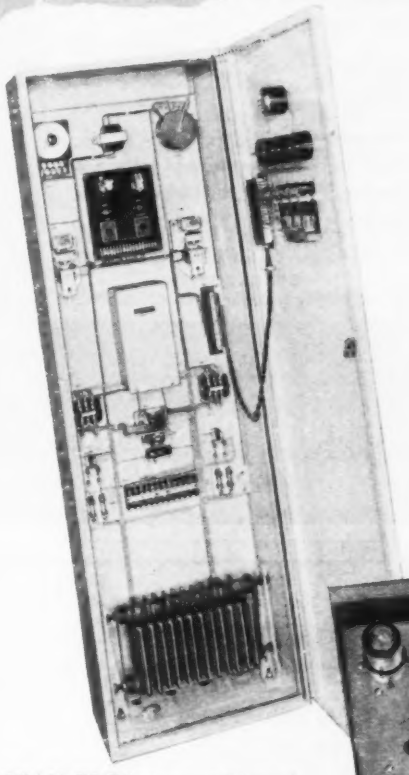
Mr Chesney was a past-president of the American Institute of Electrical Engineers and the recipient of its Edison Medal (1921).

•

▶WALTER V. DAVEY, president and treasurer of the Dano Electric Co, Winsted, Conn., died on Nov 17 in that city. Mr Davey was born in Cortland, N. Y., and began his industrial career with the States Co, Hartford. Later he joined the Anaconda Wire & Cable Co at Muskegon, Mich., but soon returned to


# CUT YOUR DEMAND COSTS with PEAK-TROL

THE IMPROVED METHOD OF PEAK LOAD CONTROL



PEAK-TROL transmitter is compact. Operates automatically or manually as desired. Drops or picks up loads in less than 7 seconds.

PEAK-TROL receiver is located at each off-peak load site. Has only one moving part. Built for long trouble-free service.

Drop your off-peak loads automatically whenever load peaks occur. Pick up loads again when load peaks are past. That is PEAK-TROL performance. This new method of peak load control cuts down the load peaks . . . builds up the load valleys. PEAK-TROL helps you boost your load factor.

**SAVE MANY DOLLARS MONTHLY**

Save hundreds of dollars monthly . . . yes, thousands of dollars yearly by using PEAK-TROL. It operates any time, day or night to keep demand costs always at a minimum.

**IMPROVE USER SERVICE**

More hot water available when it is needed. More off-peak loads may be added. Current is always "on" for these loads except peak periods.

**New FREE 8 page PEAK-TROL Bulletin TA-1 available now! Shows how it operates . . . how it is applied to a power system . . . and tells about the many new features.**

**WRITE FOR YOUR FREE COPY RIGHT NOW!**

**CONTROL CORPORATION**

719 CENTRAL AVE. • MINNEAPOLIS 14, MINN.

• Super-Trol • Peak-Trol • Telemetering • Battery Chargers • Carrier Current •

**BLACKBURN**
*Hi-Strength*
**GROUND ROD CLAMP**

**3 Big Features!**

***Truly High Strength!*** Body and set screw are made of DURONZE III—50% stronger than other alloys. Hence, clamp will not distort — will stay tight.

***A Heavy Clamp*** in the Lowest Price Range.

***Pressure Bar Aligns Wire*** with rod and distributes pressure of set screw over a greater length of wire, making a very low resistance connection.

For better performance specify
**BLACKBURN**
Hi-Strength Ground Rod Clamps

REA APPROVED

BUILDERS OF QUALITY PRODUCTS FOR 15 YEARS
JASPER BLACKBURN PRODUCTS CORP.
FIRST, MADISON & CLINTON STS. • ST. LOUIS 6, MISSOURI



# AN OLD CHINESE MAXIM . . . .

*"A single conversation across the table with a wise man is better than ten years' mere study of books."*

And this old Chinese proverb is just as true today. Take the subject of wire stringing, for instance. Ask any old timer. He'll quickly tell you that an improperly tensioned wire just *won't* stand up. Can't be too loose, can't be too taut. One wrong guess can create an awful lot of havoc.

Nowadays, there's no need to guess when it comes to wire stringing. An inexpensive, highly accurate Dynamometer guarantees a perfect job. "Sight and sag" and "oscillation" methods of tension indication are truly obsoleted by this modern instrument.

Dillon Engineers have compiled a valuable set of wire stringing report sheets that is yours for the asking. The result of years of careful study of questions submitted by leading utilities. This data very likely contains the answers to problems that have been puzzling *you!*

***WRITE FOR FREE COPY*** **of these wire stringing report sheets. The illustrated Dillon Dynamometer catalog will be included. For *better* wire stringing and prestretching, you owe it to yourself to write today!**

**W. C. DILLON CO. INC.** 5410 W. HARRISON ST. CHICAGO 4, ILLINOIS


Winsted to establish his own coil manufacturing company. Later he joined Robert L. Noble and coined the firm name of Dano from the first two letters of their names. In 1936 the business was incorporated as the Dano Electric Co. Mr Davey was a member of the State Legislature and chairman of the economy committee in the 1947 General Assembly.

►WILLIAM A. BUTTRICK, 73, former president of the Twin State Gas & Electric Co, later the Central Vermont Public Service Corp, Rutland, died at Concord, Mass., on Nov 21. For a time after retirement from utility management he was a member of the Concord Municipal Electric Light Commission. In his earlier career he was connected with the Stone & Webster organization, Boston, and at one time was manager of the old Adirondack Power & Light Co. He retired in 1936.

►AMANDES M. BOYER, who supervised the installation of machinery for the initial electric power plant in Catasauqua, Pa., and was the first employee of the Catasauqua Power & Light Co, died on Nov 23 in Riverdale, Md. He was 85 years of age. A machinist for the Davies & Thomas Co at the time the Catasauqua Power Co was formed in 1890, Mr Boyer was placed in charge of the installation of four dynamos in the new light plant. When the lights were first turned on on Thanksgiving Day, 1890, Thomas A. Edison went to Catasauqua for the occasion. Mr Boyer retired in 1940 from the Pennsylvania Power & Light Co, which took over the earlier company.

► HUGH M. STOLLER, electrical engineer for the Bell Telephone Laboratories, New York, died on Nov 17 at a hospital in Hoboken, N. J., after a heart attack. He was 56 years old. Mr Stoller was stricken on his way to the laboratories from his home at Mountain Lakes, N. J. Holder of more than 70 patents, Mr Stoller had been associated with the Bell system for 34 years. A pioneer in the electronic control of motors, he was born in Schenectady, N. Y., and obtained engineering degrees from Union College in 1913 and 1915. He joined the engineering department of Western Electric Co in 1913 and continued with Bell Telephone Laboratories when they were organized in 1925. Mr Stoller was a member of the American Institute of Electrical Engineers and of other technical associations and was the author of numerous technical papers.

►THOMAS J. TERRY, merchandise manager for the Dallas-Fort Worth (Tex.) offices of the Graybar Electric Co, died

in Dallas on Nov 12. He was 42 years old. Mr Terry started with the company as a salesman in Dallas in 1934. He was a native of Fort Worth and worked there several years following attendance at Texas A & M College.

▶MARK WOODWARD, director of the cement and allied plants division of the Vulcan Iron Works, Wilkes-Barre, Pa., died suddenly on August 22 at his home in that city. A native of Washington, D.C., and a graduate of George Washington University, Mr Woodward had been affiliated with the Vulcan company for the past year and a half. During World War I he was an engineer with the U. S. Navy. Afterward he joined the Lehigh Portland Cement Co, Allentown, and subsequently the Babcock & Wilcox Co. In World War II he was with the Ordnance Department of the U. S. Army at Sandusky, Ohio. Mr. Woodward was a member of the American Institute of Electrical Engineers.

▶FRANK W. LOOMIS, veteran illuminating engineer of Los Angeles, Calif., died recently. After his retirement from the illuminating engineering staff of the Los Angeles Department of Water and Power in 1939, he was on the faculty of the Los Angeles School of Optometry. Some years ago he was with what was then the Hygrade-Sylvania Corp. Mr Loomis was a member of the Illuminating Engineering Society since its formation in 1906.

▶W. R. GIRTMAN, communications director of the Florida Railroad and Public Utilities Commission, died on Nov 10 as the result of a heart attack. He was 55 years old. Mr Girtman had been a director for the past few months after serving nearly seven years as chief telephone engineer for the commission. Mr Girtman was a graduate of Georgia Tech.

▶JAMES L. DRANE, business manager of the Central Arizona Light & Power Co in Phoenix, died on Nov 14 at his home in that city at the age of 44. Born in Mesa, Mr Drane had resided in Phoenix since 1923 and had been connected with the local utility for 23 years.

▶C. ERNEST UPHAM, 53, chief engineer of the Walter Baker division of General Foods Corp, Dorchester, Mass., died at Milton, Mass., Nov 13. He was born in Canada and joined the company 32 years ago.

▶C. B. FENNELL, former head of the municipal electric system and waterworks department of Chester, S. C., died on Nov 15 after an illness of five months. He was 58 years old.


# BE SAFE
## AVOID TRANSFORMER EXPLOSIONS or FIRE HAZARDS

**Like this**—News items in Metropolitan New York newspapers November 1st record that a transformer explosion and fire rocked New York's Radio City. The cause was attributed to oil burning in the transformers, occupying a vault nearly a block long underneath the sidewalk.

Such hazards can be avoided with

## MARCUS *AIR-COOLED* TRANSFORMERS

There's no oil to burn or explode—no messy or toxic liquids—no need of a fireproof vault. In addition, *Marcus Air-Cooled Transformers* are economical—compact—efficient. They're built to be installed and then forgotten for they do not require attention or maintenance. Electrically, you can be assured of cool, continuous operation at rated capacity. Heatproof Class B (glass, mica, asbestos etc.) insulation withstands severest operating conditions.

*Marcus Air-Cooled Transformers* are available in sizes up to 500 KVA, single or three phase in voltages up to 13,200.

• IMPORTANT — GOOD DELIVERIES CAN NOW BE MADE

Write for more details

*Unit illustrated is a 500 KVA, 4160/120/208Y, 60 cycle, 3 phase Transformer*

1465

## MARCUS TRANSFORMER CO., INC.

34 Montgomery Street, Hillside 5, New Jersey

# MANUFACTURERS & MARKETS

**A NAME IS BEING SOUGHT for these transformers on the assembly line of the Pennsylvania Transformer Co. The company claims advantages for them because of their core construction. The cores are wound of high-permeability, cold-rolled, oriented steel. Laminations are so arranged that the direction of rolling and of the flux is kept in the same plane. Laminations are individually wrapped, making each a core in itself. Three prizes are being offered in the contest closing Dec 15**

## Manufacturers Announce Plant Expansion Plans

Purchase of the two-story and basement building at 34 East Logan St, Philadelphia, one block from its main plant, has been made by Leeds & Northrup Co. The building was owned and occupied by the Automatic Temperature Control Co, Inc, which has consolidated at a new location operations previously carried on at this and two other locations. The newly acquired property will add approximately 11,000 sq ft of floor space to the 288,886 sq ft now in use at the Leeds & Northrup plant on Stenton Ave. The purchase price was not revealed.

To better serve the West Coast, the Electric Products Co, Cleveland, has established district offices at Portland, San Francisco and Los Angeles. In charge of the Portland office (342 Sherlock Building) is William J. Cottrell, who has extensive experience in the electrical field. His connections have included the General Electric Co, as electrical engineer for a mining company in Colorado and with the power specialty division of Johns-Manville. At the time of his new assignment he was an agent for the Electric Products Co. The San Francisco representative is Donald T. Elliott, who has been an agent in the Bay Area for the company for the past ten years. In Los Angeles, the office is under the direction of H. D. Easterbrook. After a long period of service with Westinghouse, Mr Easterbrook became a manufacturers' agent in the Los Angeles district.

Illinois Electric Porcelain Co, Macomb, Ill., is embarking on a plant expansion program on which will be spent approximately $145,000 for facilities and equipment. Construction of a new addition covering 17,000 sq ft is underway, foundations are in, and it is anticipated that the steel framework will have been erected by Jan 1. The building will house a new oil-fired, 28-burner kiln measuring 3½ ft wide by 4 ft high by 201 ft in length, which will offer 50 percent additional kiln capacity at maximum speed to Illinois' present output.

Graybar Electric Co has occupied its new office and warehouse building at 2406 East 12th St., Tulsa. It has 14,400 sq ft of floor space and provisions have been made for expansion to the west.

## International Agreement on Batteries Must End

A 56-year old international agreement on electric storage batteries has been terminated as a result of a consent decree entered recently before Judge John C. Knox of the Federal Court at Cleveland.

The government contended the agreement between the Electric Storage Battery Co and the Willard Storage Battery Co, both of Cleveland, divided world markets in violation of anti-trust laws.

The decree requires the two companies to divest themselves from their interests in the Chloride Electrical Storage Co through the transfer of its holdings to a trustee. The decree also makes various patents available to manufacturers upon the payment of a reasonable licensing fee.

•

## Moves Offices to Schenectady

Gradual transfer of the American Locomotive Co main office in New York to Schenectady, N. Y., is now taking place. The office of George Mason, director of information, is now located

# NEW!

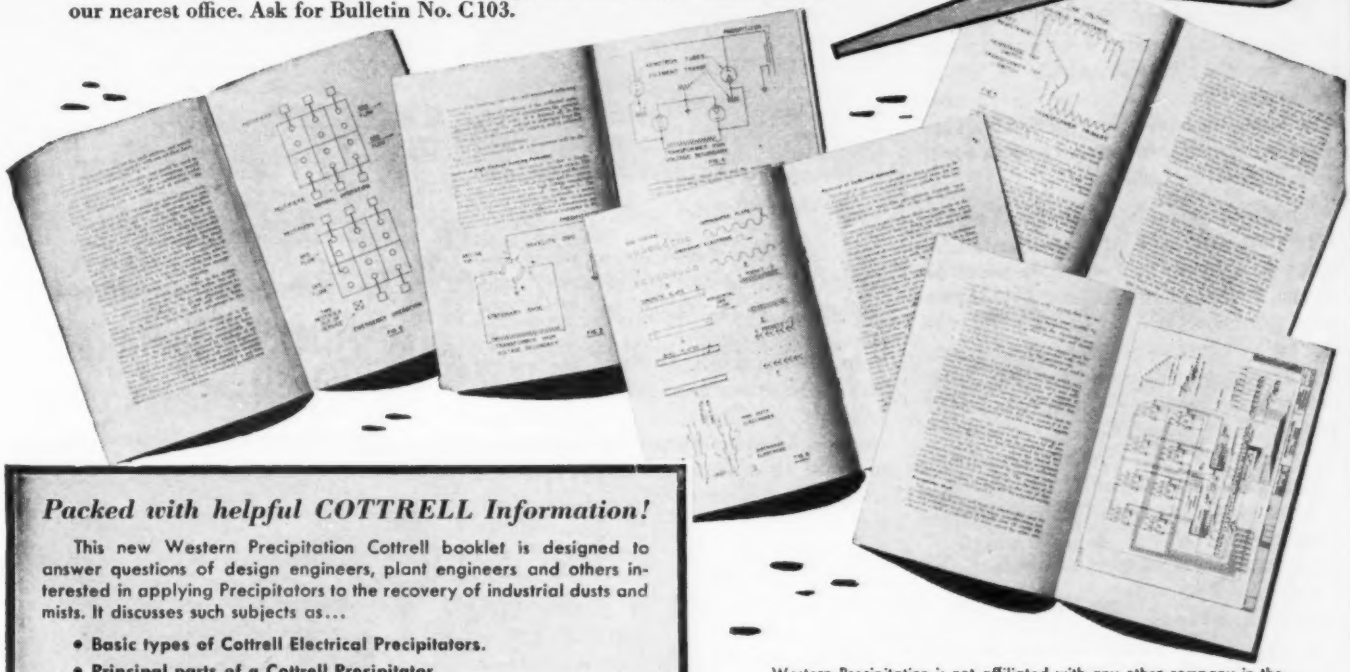
**From Western Precipitation—the organization that pioneered the commercial application of Cottrell Precipitation...**

**IF YOU ARE ENGAGED in any phase of industry where the recovery of dusts, fumes, fly ash, mists, fogs or other suspensions from gases is a problem, you will find this new booklet on the COTTRELL Electrical Precipitator helpful and informative.**

Western Precipitation pioneered and installed the first commercial application of the well-known COTTRELL Electric Precipitator—Dr. Cottrell, the inventor, being a member of the company. And for more than 38 years Western Precipitation has consistently led in developing new COTTRELL advancements and techniques for recovering suspensions from gases, both wet and dry.

This new 28 page booklet summarizes many of the basic facts you should know about modern COTTRELL Precipitators—the various types available, how they operate, principal types of electrode systems and rectifiers, shell constructions, etc. As long as the supply lasts, a free copy will be sent you on request to our nearest office. Ask for Bulletin No. C103.

**28 PAGES**
**of helpful facts to know about**
**COTTRELL ELECTRICAL PRECIPITATORS**



## *Packed with helpful COTTRELL Information!*

This new Western Precipitation Cottrell booklet is designed to answer questions of design engineers, plant engineers and others interested in applying Precipitators to the recovery of industrial dusts and mists. It discusses such subjects as...

- **Basic types of Cottrell Electrical Precipitators.**
- **Principal parts of a Cottrell Precipitator.**
- **Mechanical and Electronic Rectifiers.**
- **Various types of Collecting Electrodes (rod curtains, corrugated plates, dual plates, pocket electrodes, etc.).**
- **Removal of Collected Material.**
- **Factors in Shell Construction (steel, concrete, brick, etc.).**
- **Operating Efficiencies and the Effect of Various Factors on Performance.**

...and many other basic Cottrell facts. Write for your free copy of Bulletin C103 today while supplies are adequate!

Western Precipitation is not affiliated with any other company in the field of electrical precipitation except its wholly owned subsidiaries, International Precipitation Corporation and the Precipitation Company of Canada, Ltd. Whether you are now contemplating the installation of a Cottrell Electrical Precipitator, or may be interested in such an installation at a future date, we can and will serve you in any part of the United States or other countries.

**NOW SELLING....**

**COTTRELL Precipitators**
**MULTICLONE Collectors**
**TURBULAIRE Spray Dryers**

**...in all parts of the U.S.A. and foreign countries.**

**WESTERN Precipitation CORPORATION**

ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

*Main Offices:* 1004 WEST NINTH STREET, LOS ANGELES 15, CALIFORNIA
CHRYSLER BLDG., NEW YORK 17 • 1 LaSALLE ST. BLDG., 1 N. La SALLE ST., CHICAGO 2 • HOBART BUILDING, SAN FRANCISCO 4, CALIFORNIA
PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

## Where and How to Use *Crapo* Steel Conductor

### Ask for This Guide to Low-Cost Rural Lines!

If future plans call for the extension of rural service, be sure to ask for a copy of this Manual! A study of its contents will show where and how *Crapo* Steel Conductors can be used to profitable advantage in rural distribution systems.

This illustrated book contains pertinent data on the electrical characteristics and electrical performance of these unique conductors. It shows how construction costs can be reduced by the use of long spans, gives initial and final sag and tension data, describes construction practices, cites typical installations.

*Crapo* Steel Conductors are especially applicable to rural taps and branches where construction and maintenance costs are important considerations. The experience of a number of leading utilities over a period of years shows conclusively that *Crapo* Steel Conductors are giving dependable, economical and efficient service on thousands of miles of line in rural areas.

*Crapo* Steel Conductors are distributed by Graybar Electric Company, Inc. Ask a Graybar representative for a copy of the *Crapo* Steel Conductor Manual or write direct for Manual No. 110-C.

**Indiana Steel & Wire Company**
Muncie, Indiana

***Crapo* Steel Conductors**


at Schenectady. The transfer of the entire public relations department will be completed next April.

•

## $190,000,000 Market Will Come with Increased Load

A $190,000,000 market for electrical wholesalers will be created by 100,000 kw of new domestic load on the West Coast during 1948. Charles A. Dostal, vice-president, Westinghouse Electric

C. A. Dostal

Corp, told the Fall Convention of the National Electrical Wholesalers Association, Pacific Zone, at Riverside, Calif., Nov 15.

In an unusual analysis of the wiring and appliances needed to build each kilowatt of domestic load increase, Dostal told his audience how they stood to share in the $300,000,000 expansion program of western utilities for 1948, if they geared themselves with adequate manpower, trained personnel, and proper sales effort.

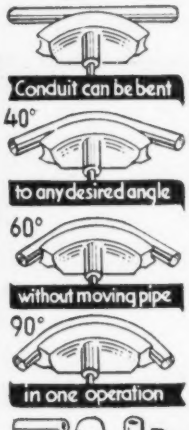
Dostal determined the extent of the wholesalers' share in electrically equipping the 200,000 new homes, or their equivalent, that will bring about this 100,000 kw of new domestic demand. It takes two homes, he said, to build 1 kw of new demand. Each of these new homes will require $870 worth of wiring and appliances, setting up an electrical market of $174,000,000 for dealers and distributors. He added another $15,000,000 as the wholesalers' share of purchases that will be made directly by the utilities, making a grand total market of nearly $190,000,000.

•

## GE Gets Peak Video Order

An order for $280,000 worth of television broadcast equipment has been placed with General Electric Co by the

**Tal Conduit and Bus Bar Bender**

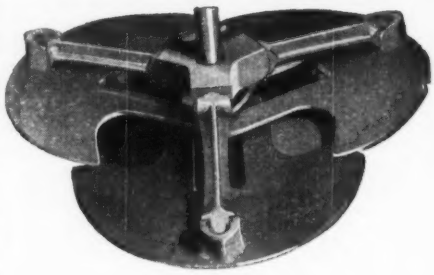



**Gain time With this best engineered tool.**

With an easy-to-operate Tal machine, anyone can make perfect, true bends, cold to any radius up to 90° in one single, uninterrupted operation. There is no need to waste time by replacing the conduit three to six times when bending. Thousands are already in use. Write for illustrated data bulletin.

TAL **Prestal Bender, Inc.**
Department EW12—Milwaukee 2, Wisconsin

**EXTRA Holding Power**
**QUICKLY Installed**
**TOUGH For long life**



# EVERSTICK ANCHORS

For new construction and maintenance — Everstick Anchors speed up work and provide dependable anchorage on all types of jobs. Made of resiliant, rust resistant malleable iron. The toughest anchors made. Write for bulletin.

**EVERSTICK ANCHOR CO.**
FAIRFIELD, IOWA

THE "SIGN" OF SAFETY!

HI-BOY SIGN
for Street & Highway Use

ALL METAL-NON-TILTING, HIGH VISIBILITY FOR STREET AND HIGHWAY USE

Will not blow over, leaving your men and the public unprotected. Sign frame pivoted on each side allowing movement with varying wind and pressures and full vision at all times.

Attractively and rigidly constructed; folds compactly for storing.

*Complete information on New Bulletin B-127*

IPCO
*Safety Equipment for all Industries*
INDUSTRIAL PRODUCTS COMPANY
2808 N. FOURTH STREET • PHILADELPHIA 33, PA.

TO SAVE HOURS and $$$ on JACKING JOBS

Swift, sure jacking can help to reduce costly breakdown time on trucks and other mobile equipment. With a Simplex Hydraulic Jack on the job you get speed, safety and easy action. The Simplex line includes a Jack to meet every need with exclusive features which insure "jack-ability" that means hours and dollars saved. Every model safety tested to 50% over rated capacity. Available for immediate delivery in 3, 5, 8, 12, 20, 30, 50 and 100-ton capacities.

TRY ONE FREE!

Let a Simplex Hydraulic Jack prove itself in action. Ask for a 30-Days Free Trial, without obligation. Specify model desired and send request on letterhead to:

TEMPLETON, KENLY & CO.
1046 South Central Avenue, Chicago 44, Illinois

Fort Industry Co, Detroit. The order is believed to be the largest ever placed for television equipment by a single station with one manufacturer.

•

## International Cuts Price of Refined Nickel 1¼¢

International Nickel Co. Inc, has announced a reduction of 1¼ cents per pound in the company's price for refined nickel in the United States. The reduction becomes effective Jan 1, 1948, simultaneously with a like reduction in the United States import duty on refined nickel provided for in the recently signed reciprocal trade agreement between the United States and Canada.

Effective Jan 1, 1948, the new United States contract price for 99.9 percent electrolytic nickel from the Port Colborne, Ontario, refinery will be 33¾ cents per pound instead of the present price of 35 cents per pound.

"The prices of nickel outside the United States are not affected by the duty and remain unchanged," Robert C. Stanley, president of the company stated.

•

## Manufacturers Make Sales Assignments

Electrical manufacturing companies have recently made the following appointments to their sales staffs:

DAYBRITE LIGHTING INC, St. Louis, has appointed Joseph N. Crevasse sales representative, covering the state of Florida with headquarters in Jacksonville. Mr Crevasse brings to his new position extensive experience in the electrical field, including connections with the Bay-Secrest Electric Co, Holt Electric Co, General Electric Supply Corp and later with the General Electric Co as Florida sales manager and then district supply sales manager in Atlanta, Ga. He then entered military service, attaining the rank of lieutenant-colonel. He was assigned to inactive duty in 1945 at his own request.

MITCHELL MANUFACTURING CO, Chicago, has appointed Irving S. Warner as district sales manager for the states of Virginia, North Carolina and South Carolina with headquarters at 336 Westwood Drive, Statesville, N. C.

MCGRAW ELECTRIC CO, Toastmaster Products Division, has appointed Robert B. Olin Chicago area domestic sales representative. He will make his headquarters at the Toastmaster Division's Chicago office, Room 1455 in the Merchandise Mart.

W. N. MATTHEWS CORP, St. Louis, has appointed R. F. Hamilton & Associates as representatives for the state of Texas. Mr Hamilton has been associated with the corporation for a number of years as sales representative in the Rocky Mountain area.

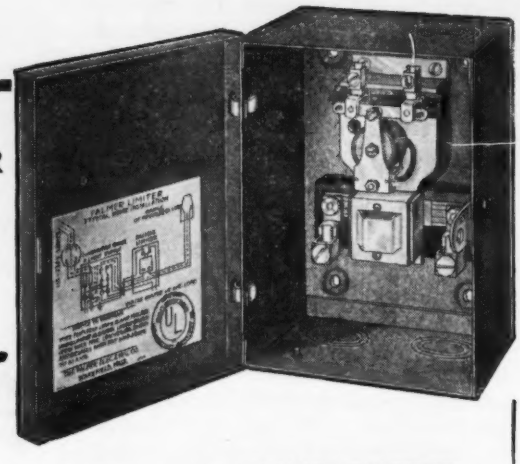
FOR FASTER SOLDERING
2 NEW WELLER SOLDERING GUNS
with
Solderlite

You can speed up and simplify the tough soldering jobs in electrical repair and maintenance work when you use the Weller Soldering gun with Solderlite.
Fast 5 second heating eliminates waiting time. Built-in spotlight finds the job faster, puts light right where you need it. Loop tip can get between wires; can be formed to get into corners.
Dual heat Model D-207 has 100/135 watts—enough heat to handle electrical maintenance jobs such as soldered connections encountered in motor rewinding, electrical and electronic control repair, instrument and meter work, etc.
See your electrical wholesaler or radio parts jobber.

WELLER
MANUFACTURING CO.
817 Packer St., Easton, Pa.
In Canada: Atlas Radio Corp., Ltd., 560 King St., N. W., Toronto, Ont.
Export Dept.: 25 Warren St., New York 7, N. Y.

ELECTRIC POWER ECONOMIES

PALMER LIMITERS



• More and more utilities are turning to the PALMER LIMITER METHOD of controlling electric range and water heater loads. The use of PALMER LIMITERS improves the domestic load factor without increasing the power supply investment.

You cannot afford to neglect this opportunity for extra load dividends. Investigate the PALMER LIMITER.

Listed by Underwriters' Laboratories.

WRITE FOR BULLETIN A-1

PALMER AM AC SWITCH

PALMER ELECTRIC & MFG. CO.
24 Water St., Wakefield, Mass.

finishing cloths flat or formed

CABLE-SPLICERS WIPING CLOTHS

catch cloths

packed in cartons

*Select herringbone ticking has no equal*

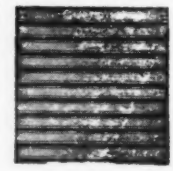
*Wiping Surfaces Treated; Ready For Use*

*REQUIRE NO BREAKING-IN*

*Wipe Perfect Joints*

*on lead-sheathed cable splices*

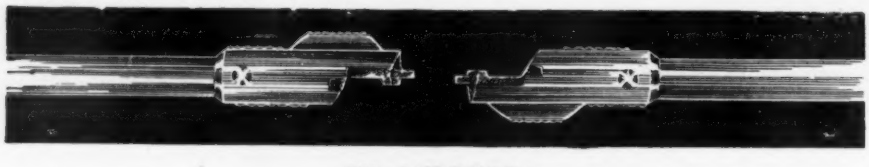
*Write for literature & prices*



sealed in wax paper wrappers

GEO. E. WILLIAMS, Mfr.

3035 Aldrich Avenue So. Minneapolis 8, Minn.



ALL ALUMINUM

CONDUIT RODS

STRONG . . . LIGHTWEIGHT . . . EASY TO WORK WITH . . . TIGHT-LOCKING . . . NO MALE AND FEMALE JOINTS . . . EACH COUPLER IDENTICAL . . . *WRITE TODAY FOR DETAILS AND PRICES.*

ABBOTT & MATHEWSON, INC.
ELLICOTT SQUARE BUILDING • BUFFALO 3, N. Y.

# CONSTRUCTION

**NEW ELECTRICAL construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included**

## UTILITIES

### *Proposed Construction*

**Arkansas**—U. S. Eng., P.O. Box 60, Vicksburg, Miss., design, manufacture, testing and del. f.o.b. railroad cars at Nashville, transformers, oil circuit breakers, lightning arresters and disconnecting and grounding switches and to furnish services of erecting engineers, Narrows Dam Power Plant, Little Missouri River near Murfreesboro, Pike Co., Serial No. W-22-052-eng-48-182, station power and control equip., to furnish service of erecting engineers for Narrows Dam Power Plant, Little Missouri River near Murfreesboro, Pike Co., Serial No. W-22-052-eng-48-180.

**California**—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., furnishing, del., f.o.b. cars shipping point or f.o.b. cars Coram, Redding, Sacramento, and Bethany, 11 single-frequency and 4 double-frequency, 800 ampere, carrier-current line traps; 10 single-frequency and 2 double frequency 400-ampere, carrier-current line traps: ten 230,000 volt, thirty 115,000 volt and six 69,000 volt coupling capacitors with potential devices for Shasta and Keswick Power Plants, Elverta substation, Tracy switchyard, on the Central Valley Proj., Spec. 2032. Plans deposit 75c. Walker R. Young, ch. engr.

**Colorado**—Y-W Electric Assoc., Yuma, rehabilitating generating plant and 40 mi. distr. lines and constructing 242 mi. rural distr. lines, Yuma Co. **$608,000.**

**Ind., North Madison**—State, O. F. Jeslar, dir. Div. Procurement & Supply, 404 State House, Indianapolis, electrical distr. sys., for 20 bldgs., State Hospital. **$300,000.** Ammerman, Davis & Stout, 912 K. of P. Bldg., Indianapolis, engrs.

**Iowa**—Iowa-Illinois Gas & Electric Co., Rock Island, Ill., 80 mi. rural distr. lines from Des Moines to Fort Dodge. **$1,500,000.**

**Kan., Lindsborg**—City power plant. **$70,000.** C. W. and J. A. Shaver, 205½ S. Santa Fe St., Salina, archts.

**Mich., Detroit**—Ernst Kern, pres. Public Lighting Comn., 174 E. Atwater St., furnishing, installing 24 kv outdoor switching station at Bluehill and Mack Aves. incl. one 23 kv, 600 ampere outdoor type oil circuit breaker; and structural steel frame, for Pub. Lighting Comn. Plans deposit $10. George R. Thompson, City Hall, city engr.

**Mississippi**—Southern Pine Electric Power Assoc., Taylorsville, sys. imprvs. and headquarters facilities, constructing 411 mi. rural distr. lines, Smith Co. **$1,090,000.**

**Montana**—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., electrical distr. sys. for Canyon Ferry Government Camp, Canyon Ferry Unit, Missouri Basin Proj., on east side of Missouri River approx. 15 mi. east of Helena, Spec. 2031. W. R. Young, ch. engr.

**Neb., Columbus**—Consumers Public Power Dist., Columbus, sub-station and equip. **$75,000.**

**Oregon-California**—Bureau Reclamation, Dpt. Interior, Building 1-A, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Spring Lake Siding, Klamath Falls, 2 motor-driven vertical-shaft pump. units and motor-control equip. for installation in Pump. Plants E and F. Spec. 2022.

**Pennsylvania**—U. S. Eng., P.O. Box 1715, Baltimore, Md., Sunbury Flood Protection Proj., Lower Susquehanna River Sect., Unit 1, 2.5 mi. flood protection structures, incl. 2,000 lin. ft. rolled-earth levee embankment about 21 ft. high; 2,425 lin. ft. modified rolled-earth levee embankment about 15 ft. high with concrete I-type floodwall with steel sheet piling, 5,120 lin. ft. concrete I-type floodwall